

ITEM # 0913021A – 6’ CHAIN LINK FENCE

ITEM # 0913907A – 26’ CHAIN LINK DOUBLE GATE 6’ HIGH

ITEM # 0913931A – 24’ CHAIN LINK DOUBLE GATE 6’ HIGH

Description:

Work under this item shall consist of furnishing and installing chain link fence and gates in the locations and to the dimensions shown on the plans or as directed by the Engineer.

Submit the following in accordance with Article 1.20-1.05.02 and NOTICE TO CONTRACTOR - SUBMITTALS.

1. Product Data in the form of manufacturer's technical data, specifications, and installation instructions for fence and gate posts, fabric, and accessories.
2. Shop Drawings showing location of fence, gates, each post, and details of post installation, hardware, and accessories.
3. Submit samples for verification of PVC color in form of 6 inch length of actual fabric wire to be used in color selected.
4. Quality Assurance Submittals: Installer Qualifications: Engage an experienced Installer who has at least three years' experience and has completed at least five chain link fence projects with same material and of similar scope to that indicated for this Project with a successful construction record of in-service performance.

Single-Source Responsibility: Obtain chain link fences and gates, including accessories, fittings, and fastenings, from a single source.

Materials:

General: Round member sizes are given in actual outside diameter (OD) to the nearest thousandth of inches. Round fence posts and rails are often referred to in ASTM standard specifications by nominal pipe sizes (NPS) or the equivalent trade sizes in inches. The following indicates these equivalents all measured in inches:

<u>Actual OD</u>	<u>NPS Size</u>	<u>Trade Size</u>
1.315	1	1-3/8
1.660	1-1/4	1-5/8
1.900	1-1/2	2
2.375	2	2-1/2
2.875	2-1/2	3
3.500	3	3-1/2
4.000	3-1/2	4
6.625	6	6-5/8
8.625	8	8-5/8

FENCE POSTS AND RAIL:

General: Type I Round Posts, standard weight (schedule 40) galvanized-steel pipe conforming to ASTM F 1083, according to heavy industrial requirements of ASTM F 669, Group IA, with minimum yield strength of 25,000 psi, not less than 1.8 oz. of zinc per sq. ft. Type A coating inside and outside according to ASTM F 1234, as determined by ASTM A 90, and weights per foot as follows:

<u>Actual OD(in)</u>	<u>Weight(lb/ft)</u>
1.315	1.68
1.660	2.27
1.900	2.72
2.375	3.65
2.875	5.79
3.500	7.58
4.000	9.11
6.625	8.97
8.625	28.55

Supplemental Color Coating: In addition to above metallic coatings, provide posts and rails with manufacturer's standard polymer coating according to ASTM F 1234, 10-mil minimum polyvinyl chloride (PVC) or 3-mil minimum polyester plastic resin finish applied to exterior surfaces and, except for tubular shapes, to exposed interior surfaces. Color to match chain link fabric.

Line or Intermediate Posts: 2.375-inch OD Type I round steel pipe.

End, Corner, and Pull Posts: 2.875-inch OD Type I round steel pipe.

Swing Gate Posts: Furnish posts to support single gate leaf, or one leaf of a double-gate installation, according to ASTM F 900, sized as follows for steel and pipe posts:

1. Fence height over 6 feet and gate leaf width:
 - a. Up to and Including 6 Feet: 2.875-inch OD pipe weighing at least 4.64 lb per ft.

Top Rail: Manufacturer's longest lengths (17 to 21 feet) with swaged-end or expansion-type coupling. Provide rail ends or other means for attaching top rail securely to each gate, corner, pull, and end post. 1.660-inch OD Type I round steel pipe.

GATE FRAME MEMBERS:

Swing Gate Frame Members: Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories. The gate frame shall be constructed from same material and finish as fence framework, welded at all corners or assembled with corner fittings. Members are sized as follows for steel and pipe posts:

1. Gate height over 6 feet: 1.90-inch OD round pipe weighing at least 2.28 lb. per foot.

Truss rods: Gate frames assembled with corner fittings shall have adjustable truss rods. 5/16-inch OD round pipe of the same metal and finish as the frame.

Interior bracing: Gate leaf shall have vertical interior bracing at maximum intervals of 8 ft. and shall have a horizontal interior member if fabric height is 8 ft. or more. Additional horizontal, vertical or diagonal member or diagonal truss rods may be needed to comply with ASTM F 900 Section 5.2.1. 5/16-inch OD round pipe of the same metal and finish as the frame.

FABRIC:

Steel Chain-Link Fence Fabric: Fabricated in one-piece widths for fencing 12 feet and less in height to comply with Chain Link Fence Manufacturers Institute (CLFMI) "Product Manual" and with requirements indicated below:

1. Mesh and Wire Size: 2-inch mesh, 0.148-inch diameter (9 gage).
2. Coating: ASTM A 817, Type 1, 0.40 oz./ft² aluminum coating.
3. PVC Coating Color: Dark green, complying with ASTM F 934.

Chain Link Gate Fabric: The fabric shall same as specified for fence. Secure fabric at vertical edges with tension bars and bands and to top and bottom of frame with tie wires.

FITTINGS AND ACCESSORIES:

General: Comply with ASTM F 626. Mill-finished aluminum or galvanized iron or steel to suit manufacturer's standards. Unless specified otherwise, hot-dip galvanize pressed steel or cast-iron fence fittings and accessories with at least 1.2 oz. zinc per sq. ft. as determined by ASTM A 90.

Supplemental Color Coating: In addition to above metallic coatings, provide a 10-mil minimum polyvinyl chloride (PVC) or 3-mil minimum polyester plastic resin finish applied to exterior surfaces and, except inside cap shapes, to exposed interior surfaces. Color to match chain link fabric.

Post and Line Caps: Provide weather-tight closure cap for each post. Provide line post caps with loop to receive top rail.

Post Brace Assembly: Manufacturer's standard adjustable brace. 1.660-inch OD Type I round steel pipe for brace, and truss to line posts with 3/8-inch-diameter rod and adjustable tightener. Provide manufacturer's standard galvanized-steel, cast-iron or cast-aluminum cap for each end.

Top Rail Sleeves: Rail sleeve material shall be a minimum of 0.051 in. in thickness, and a minimum of 6 in. in length. Rail sleeve must be fabricated to prevent movement along the rail.

Tension or Stretcher Bars: Hot-dip galvanized steel with a minimum length 2 inches less than the full height of fabric, a minimum cross section of 3/16 inch by 3/4 inch, and a minimum of 1.2 oz. of zinc coating per sq. ft. Provide one bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into the post.

Tension and Brace Bands: 3/4-inch-wide minimum hot-dip galvanized steel with a minimum of 1.2 oz. of zinc coating per sq. ft.

1. Tension Bands: 0.074 inch thick (14 gage) minimum.
2. Brace Bands: 0.105 inch thick (12 gage) minimum.

Truss Rod Assembly: Steel rods shall be 5/16 in. diameter and it and all related devices shall be hot-dip galvanized after threading with a minimum of 1.2 oz. of zinc coating per sq. ft. Truss rod and tightener shall be capable of withstanding a tension of 2000 lb.

Tension Wire: 0.177-inch-diameter metallic-coated steel Marcellled tension wire conforming to ASTM A 824 with finish to match fabric. Coating shall be Type I aluminum with a minimum coating weight of 0.40 oz. per sq. ft. as determined by ASTM A 824.

Tie Wires and Clips: 0.148-inch diameter (9 gage) steel with a tensile strength range from 55 to 65 ksi with a minimum coating of 0.40 oz./ft² of aluminum. Round metallic-coated steel tie wires, clips and hog rings shall withstand all forming or twisting operations without cracking or flaking of the aluminum coating. Bend ends of wire to minimize hazard to persons or clothing.

Privacy Slats: Winged-type, extruded PVC members of length to match fence height

1. Color: Green.

GATE HARDWARE:

General: Provide galvanized hardware and accessories for each gate.

Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180-degree gate opening. Provide 1-1/2 pair of hinges for each leaf over 6-foot nominal height.

Latch: Drop rod or plunger-bar type to permit operation from either side of gate, with padlock eye as an integral part of latch.

Keeper: Provide a keeper for vehicle gates that automatically engages gate leaf and holds it in the open position until manually released.

Gate Stops: Provide gate stops for double gates consisting of mushroom-type flush plate with anchors, set in concrete, and designed to engage a center drop rod or plunger bar. Include a locking device and padlock eyes as an integral part of the latch, permitting both gate leaves to be locked with a single padlock.

Chain: Provide welded stainless steel, Type 347 0.375 dia. chain in lengths required as specified by the Engineer.

Construction Methods:

General: Install fence to comply with ASTM F 567, in the location indicated on the drawings. Do not begin installation and erection before final grading is completed, unless otherwise permitted.

Excavation: Drill or hand-excavate (using post-hole digger) holes for all posts to diameters and spacings indicated, in firm, undisturbed or compacted soil. All excavated soil material shall be handled in accordance with Section 2.02, "Earth Excavation." Excavate holes for each fence post to a minimum of 9 inches in diameter for all line posts and 12 inches in diameter for terminal, pull or corner posts, but not less than four times the largest cross section of post. Excavate holes for all fence posts to depths not less than 40 inches below finish grade surface. Gate post holes shall comply with the following:

1. Gate width up to 12 feet: Excavate to a minimum diameter of 12 in. and a minimum depth of 40 in.

Setting Posts: Center and align posts in holes 4 inches above bottom of excavation. Space a maximum of 10 feet o.c., unless otherwise indicated. Pull posts shall be provided where a change in vertical or horizontal alignment of ten (10) degrees or more occurs. Place concrete for the full depth of excavation, around all posts (including, but not limited to, line, corner and gate posts) and vibrate or tamp for consolidation. Unless otherwise indicated, extend concrete footings 2 inches above grade and trowel to a crown to shed water. Protect portion of posts above ground from concrete splatter. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.

Brace Assemblies: Install braces at end and gate posts and at both sides of corner and pull posts. Locate horizontal braces at mid-height of fabric on fences with top rail and at two thirds fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

Top Rails: Run rail continuously through line post caps for entire length of fence, terminating at rail end attached to posts or at post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.

Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric before stretching fabric and tie to each post with not less than same gage and type of wire. Pull wire taut, without sags. Fasten to fabric with wire ties spaced a maximum of 24 inches o.c.

Fabric: Apply fabric to outside of the area enclosed. Leave approximately 2 inches between finish grade and bottom selvage. Place the fabric by securing one end and applying sufficient tension to remove all slack before making attachment elsewhere. Tighten the fabric to provide a smooth uniform appearance free from sag. Cut the fabric by untwisting a picket and attach each span independently at all terminal posts. Thread tension bars through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not over 15 inches o.c. Fasten fabric to the line posts at intervals not exceeding 15 in. Fasten fabric to the rail or tension wire at intervals not exceeding 24 in.

Privacy Slats: Install privacy slats according to manufacturer's instructions.

Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts for added security.

Gate Installation: Install gates, according to manufacturer's instructions, plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary. After repeated operation of completed installation equivalent to 3 days use by normal traffic, readjust gates and gate operators and controls for optimum operating condition and safety. Lubricate operating equipment and clean exposed surfaces.

Method of Measurement:

Chain Link Fence: This work shall be measured for payment by the number of linear feet of completed and accepted chain link fence of the height specified, measured from outside to outside of terminal posts.

Chain Link Gates: This work shall be measured for payment by the actual number of gates of the height and width specified, installed and accepted.

Basis of Payment:

Chain Link Fence: This work shall be paid for at the unit price per linear foot for "Chain Link Fence" of the height specified, complete in place, which price shall include all materials, equipment, tools, excavation, backfill, disposal of surplus material and labor incidental thereto.

Chain Link Gates: This work shall be paid for at the contract unit price each for "Chain Link Gate" of the height and width specified, complete in place, which price shall include all materials, equipment, tools, excavation, backfill, disposal of surplus material and labor incidental thereto.

Pay Item

6' Chain Link Fence

26' Chain Link Double Gate 6' High

24' Chain Link Double Gate 6' High

Pay Unit

L.F.

EA.

EA

ITEM # 1400075A – 4” P.V.C. FORCE MAIN (SANITARY SEWER)

Description:

This item shall consist of furnishing all labor, materials, tools and equipment necessary to install and test the 4” sanitary sewer force main from Pumping Station (Sanitary Sewer) to the Sanitary Manhole on Brook Street. This work includes furnishing and installing the P.V.C. pipe, connecting at manholes, and restoration of the surface of the trench outside the limits of the new facility site. Pressure testing is also included as part of this item. This work shall also include all clean-out and air-release structures (manholes), fittings, valves, and appurtenances.

Submit the following in accordance with Form 816 Article 1.20-1.05.02 and NOTICE TO CONTRACTOR – SUBMITTALS.

1. Product Data for all materials.
2. Field quality-control inspection and test reports.

Quality Assurance: Materials and installation of polyvinyl chloride force main shall be in accordance with the Metropolitan District (MDC) policies and these Specifications.

Materials:

General: Polyvinyl chloride force main shall conform to the Metropolitan District (MDC) standards and these specifications.

PVC Force Main Pipe: PVC pressure pipe shall be C-900, SDR-18 in accordance with ASTM D2241, with joints conforming to ASTM D3139 and F477.

Bedding: Bedding material shall comply with the requirements of Form 816 subarticle M.08.01-21.

Underground Warning Tape: Detectable warning tape shall be acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep. Warning tapes shall be solid blue film with continuously printed black-letter caption "CAUTION--SEWER LINE BURIED BELOW."

4-Inch Fittings and Restraints: Fittings for 4-inch PVC force main shall be PVC, manufactured in one piece of injection molded compound meeting ASTM D1784. Fittings for 4-inch PVC force main shall be Class 200 and conform to requirements of DR18. Fittings shall be designed to withstand a minimum of 630 psi quick burst pressure at 73 degrees Fahrenheit, in accordance with ASTM D1599. Bells for 4-inch PVC force main shall be gasketed joint conforming to ASTM D3139 with gaskets conforming to ASTM F477. Gasket material shall be equal to that specified for pipe. PVC fittings shall be restrained with ductile iron retainers Series 6500 as manufactured by EBAA Iron, Inc., or equal. Retainers shall contain sufficient number of tie-bolts to restrain a minimum test pressure of 150 psi.

Bedding: Bedding material shall comply with the requirements of Form 816 subarticle M.08.01-21.

Underground Warning Tape: Detectable warning tape shall be acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep. Warning tapes shall be solid blue film with continuously printed black-letter caption "CAUTION--SEWER LINE BURIED BELOW."

Construction Methods:

General: Installation of polyvinyl chloride force main shall conform to the Metropolitan District (MDC) standards and these specifications.

Do not store plastic pipe and fittings in direct sunlight. Protect pipe, pipe fittings, and seals from dirt and damage. Plans indicate general location and arrangement of sanitary piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or combination of both. Where specific installation is not indicated, follow piping manufacturer's written instructions.

PVC Pipe: Basic piping joint construction is specified in CSI Division 22 Section 220500, "Common Work Results for Plumbing" Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

1. Install force-main, pressure piping according to the following:
 - a. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system.
 - b. Install piping with 54-inch minimum cover.
 - c. Install piping according ASTM D 2774 and ASTM F 1668.
2. Join PVC force-main, pressure piping according ASTM D 2855.
3. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

Excavation: Excavation and backfilling shall be performed as described herein and in accordance with Article 2.05.03 of Form 816.

Bedding: Placement of bedding material shall comply with Form 816 Section 6.51.

Warning Tape: Install detectable warning tapes directly over piping.

Field Quality Control: Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction. During installation, notify authorities having

jurisdiction at least 3 calendar days before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing installation.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
5. Test force-main piping according to procedures of MDC and all authorities having jurisdiction or, in absence of published procedures, as follows:
 - a. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - b. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - c. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 - d. Prepare reports for tests and required corrective action.

Cleaning: Clean interior of piping of dirt and superfluous material. Flush with potable water.

Method of Measurement:

This work will be measured for Payment by the actual number of linear feet of 4" P.V.C. Force Main (Sanitary Sewer) installed and accepted.

Basis of Payment:

This work will be paid for at the unit price per linear foot of "4" P.V.C. Force Main (Sanitary Sewer)" complete in place, which shall include all material, fittings, clean-out and air-release structures (manholes), fittings, valves, equipment, tools, appurtenances and labor incidental thereto. Additionally, the linear foot price shall include connections to manholes and trench surface restoration in Brook Street right-of-way and in any undisturbed grass areas. Care and protection of existing pipes and utilities, and other structures; disposing of excess materials; dewatering and warning tape are also included.

<u>Pay Item</u>	<u>Pay Unit</u>
4" P.V.C. Force Main (Sanitary Sewer)	LF

ITEM # 1403001A – MANHOLE (SANITARY SEWER)
ITEM # 1403023A – MANHOLE (SANITARY) WITH 4' SUMP

Description:

Work under this item shall consist of furnishing and installing sanitary manholes where indicate on the plans.

Quality Assurance: Materials and installation of sanitary manholes shall be in accordance with the Metropolitan District (MDC) policies and these Specifications.

Materials:

General: Sanitary manholes shall conform to the Metropolitan District (MDC) standards and the requirements of Section 5.07 of Form 816 supplemented and amended as follows:

1. Manhole frames and covers: Shall be water-tight, with $\frac{3}{4}$ " raised letters "SEWER".

Construction Methods:

General: Installation of sanitary manholes shall conform to the Metropolitan District (MDC) standards and with methods outlined in Section 5.07 of Form 816.

Method of Measurement:

This work will be measured for payment by the actual number of sanitary manholes installed and accepted.

Basis of Payment:

This work will be paid for at the unit price each for "Manhole (Sanitary Sewer)" and "Manhole (Sanitary) with 4' Sump" complete in place, which shall include all material, trench excavation, equipment, tools, and labor incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Manhole (Sanitary Sewer)	EA
Manhole (Sanitary) with 4' Sump	EA

ITEM # 0100244A – SIGNS

Description:

Work under this item shall consist of the installation of face sheet aluminum signs and metal sign posts for accessible parking spaces at locations indicated on the Plans.

Materials:

Signs shall be as indicated on the plans and shall conform to the requirements of the "Manual of Uniform Traffic Control Devices". Sheet aluminum sign blanks shall comply with the applicable requirements of Section M.18.13.

Sign Posts shall conform to the requirements of Article M.18.14.

Sign Mounting Bolts shall conform to the requirements of Article M.18.15.

Provide aluminum and fiber washers, aluminum back-up plates, and other materials as required for a complete installation.

Reflective sheeting shall conform to the requirements of Form 816, Article M.18.09.

Silk screening of the enclosed lens and encapsulated lens reflective sheet shall conform to the requirements specified by the reflective sheeting manufacturer.

Data labels shall be non-reflective, weatherproof film having a pressure sensitive adhesive backing protected by a removable liner. The data label shall be 3" square with black copy on a yellow background, containing the words "CONN D.O.T.", the month, year and product code.

Construction Methods:

Placement and dimensions of copy, border and mounting holes shall conform to details of the Department of Transportation for Regulatory Warning and Guide Signs which are available for inspection at the Department of Transportation office.

Non-reflective copy, border and background shall be applied by the silk screen process in a manner specified by the reflective sheeting manufacturer. The silk screening of all copy, border and background on encapsulated lens reflective sheeting shall be accomplished prior to the application of the reflective sheeting to the finished aluminum sign blank. Encapsulated lens reflective sheeting shall be of the heat activated adhesive type and shall be applied in a manner specified by the reflective sheeting manufacturer.

Reflective sheeting shall be applied in such a manner that the finished sign will be wrinkle and bubble free. No splices of the reflective sheeting will be permitted on any sign face under 30 square feet in area with one dimension of 4' or less and no more than one splice will be permitted on any one sign without the approval of the Engineer.

Direct application of cutout enclosed lens and encapsulated lens reflective sheeting copy and border shall conform to the requirements specified by the reflective sheeting manufacturer. Cutout copy and border shall be applied directly to clean, dust free reflective sheeting background used for direct applied cutout copy and border shall be uniform in brightness and color.

Apply the data labels directly to a clean, dust free aluminum surface, on the back of the sign panel, in the lower left hand corner, or in the case of irregularly shaped signs, in the lower left quadrant. The month and year of installation and the product code shall be punched out prior to application. Product codes indicate the manufacturer of the sign face material (sheeting) and are as shown on the plans.

The fabrication of aluminum sign blanks including cutting to size and the punching of mounting holes shall be completed prior to metal degreasing and the application of reflective sheeting. Aluminum sign blanks shall be free of buckles, warp, dents, cockles, burrs and defects resulting from fabrication.

After complete fabrication of the sign as indicated on the plans and in conformance with the requirements contained in the specifications, the sign shall be mounted on the type of support designated on the plans after the support has been satisfactorily installed at its proper location. The reinforcing plate shall be installed as shown on the plans.

Metal sign posts shall be driven or the holes augured and the backfill thoroughly tamped after the posts have been set level and plumb.

Method of Measurement:

This work will be measured for payment by the actual number of each sign completed, accepted and measured in place.

Basis of Payment:

This work will be paid for at the unit price each for "Signs" complete in place, which shall include the completed sign, metal sign post(s), mounting hardware, including reinforcing plates, and all material, equipment, labor and work incidental thereto.

Pay Item
Signs

Pay Unit
EA.

ITEM # 1210101A – 4” (100 mm) WHITE EPOXY RESIN PAVEMENT MARKINGS

ITEM # 1210102A – 4” (100 mm) YELLOW EPOXY RESIN PAVEMENT MARKINGS

ITEM # 1210106A – 12” (300 mm) WHITE EPOXY RESIN PAVEMENT MARKINGS

SECTION 12.10 – EPOXY RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS is amended as follows:

Delete “SYMBOLS AND LEGENDS” from the title of the section.

SECTION 12.10.03 – Construction Methods is amended as follows:

Delete the entire sections *titled* “3. Performance and Warranty:” and “WARRANTY:” and replace them with the following:

3. Initial Performance: The retroreflectivity of the markings applied must be measured by the Contractor three (3) to fourteen (14) days after installation. A Certified Test Report (CTR), in accordance with Section 1.06.07, must be submitted to the Engineer no later than ten (10) days after the measurements are taken using the procedures and equipment detailed below:

Test Lots - The following test lots shall be randomly selected by the Engineer to represent the line markings applied:

Table 3.1: Line Test Lots

Length of line	Number of Lots	Length of Test Lot
< 1.0 mi. (1.5 km)	1	1000 ft. (300 m)
≥ 1.0 mi. (1.5 km)	1 per 1.0 mi. (1.5 km)	1000 ft. (300 m)

Measurement Equipment and Procedure

Portable Retroreflectometer

1. Skip line measurements shall be obtained for every other stripe, taking no more than two readings per stripe with readings no closer than 20 in. (0.5 m) from either end of the marking.

2. Solid line test lots shall be divided into ten sub-lots of 100 ft. (30 m) length and measurements obtained at one randomly select location within each subplot.
3. For symbols and legends, 10 percent of each type shall be measured by obtaining five (5) measurements at random locations on the symbol or legend.
4. The Apparatus and Measurements shall be made in accordance with ASTM E1710 (Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer) and evaluated in accordance with ASTM D7585/D7585M (Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments).

Mobile Retroreflectometer

1. Calibration of the instruments shall be in accordance with the manufacturer's instructions.
2. Retroreflectivity shall be measured in a manner proposed by the Contractor and approved by the Engineer. The basis of approval of the test method will be conformance to a recognized standard test method or provisional standard test method.

The measurements shall be obtained when the pavement surface is clean and dry and shall be reported in millicandellas per square foot per foot candle - $\text{mcd/ft}^2/\text{fc}$ (millicandelas per square meter per lux ($\text{mcd/m}^2/\text{lux}$)). Measurements shall be obtained sequentially in the direction of traffic flow.

Additional Contents of Certified Test Report

The CTR shall also list:

- Project and Route number
- Geographical location of the test site(s), including distance from the nearest reference point.
- Manufacturer and model of retroreflectometer used.
- Most recent calibration date for equipment used.
- Grand Average and standard deviation of the retroreflectivity readings for each line, symbol or legend.

Initial Performance:

In order to be accepted, all epoxy resin pavement markings must meet the following minimum retroreflectivity reading requirement:

White Epoxy: minimum retroreflectivity reading of $400 \text{ mcd/ft}^2/\text{fc}$ ($\text{mcd/m}^2/\text{lux}$)

Yellow Epoxy: minimum retroreflectivity reading of $325 \text{ mcd/ft}^2/\text{fc}$ ($\text{mcd/m}^2/\text{lux}$)

At the discretion of the Engineer, the Contractor shall replace, at its expense, such amount of lines, symbols and legends that the grand average reading falls below the minimum value for retro-reflectivity. The Engineer will determine the areas and lines to be replaced. The cost of replacement shall include all materials, equipment, labor and work incidental thereto.

ITEM # 1301080A - 4" DUCTILE IRON PIPE (WATER MAIN)

ITEM # 1301083A - 10" DUCTILE IRON PIPE (WATER MAIN)

ITEM # 1301084A - 12" DUCTILE IRON PIPE (WATER MAIN)

ITEM # 1303204A- HYDRANT ASSEMBLY (WATER MAIN)

Description:

This item shall consist of furnishing all labor, materials, tools and equipment necessary to install and test the following, as noted on the plans or as directed by the Engineer.

1. 10" and 12" Ductile Iron water service from the existing water main in Brook St. to the new Repair Facility for fire protection.
2. Hydrant assemblies off the new 12" water main at the locations shown, or as directed by the Engineer
3. 4" Ductile Iron water service from the existing water service to the Central Stores Building to the new Repair Facility.

This work includes furnishing and installing the ductile iron pipe, fittings, valves, gate boxes, hydrants, insulation, thrust blocking and joint restraints as shown on the plans and specified herein. Sterilization and pressure testing is also included as part of this item.

Submit the following in accordance with Form 816 Article 1.20-1.05.02 and NOTICE TO CONTRACTOR - SUBMITTALS.

1. Product Data in the form of manufacturer's technical data, specifications, and installation instructions for hydrants, pipe, valves, fittings and couplings.
2. Submit Hydrostatic Test Reports, Purging and Sterilization Reports.

Quality Assurance: Materials and installation of the water main shall be in accordance with the Metropolitan District (MDC) policies and these Specifications. Comply with NSF 61, "Drinking Water System Components-Health Effects," for materials for potable water. Provide listing/approval stamp, label, or other marking on piping and specialties made to specified standards.

Coordination:

Coordinate water service connections to components furnished by the MDC

1. Coordinate installation and connection of exterior and underground utilities and services.
2. Comply with requirements of authorities having jurisdiction and utility company providing water and other services.

Water service connection work provided by others:

1. The MDC will install the wet tap of the 12-inch water main located in Brook Street. The contractor shall provide all excavation, bedding and backfill required as included in the work of the water main installation.

Contacts:

The Metropolitan District (MDC)
555 Main Street
Hartford, CT 06142
Attention: Utility Services
860-278-7850 x3703

2. A charge of \$2,000 shall be included in the contract bid price for the service connection to the facilities by the utility company. All Contractors will include the above amount for utility service charges in the Contract Bid Price. If it is determined that different charges apply, the Contractor's bid will be adjusted to reflect the differential by construction order, provided that the Contractor provides all applicable written billing documentation. The Contractor will be compensated only for the difference between the billed amount and the estimated amount. No additional Contractor markup will be allowed.
3. The Contractor shall call "Call Before You Dig!" at (800) 922-4455 before any excavation takes place. Contractor shall coordinate excavation with paving operation.

Materials:

General: All materials shall conform to the Metropolitan District (MDC) Material Specifications.

Ductile Iron Pipe: Pipe for water mains shall be Class 54 cement lined ductile iron and conform to the latest ANSI/AWWA Specification C151/A21.51 Ductile iron Pipe Centrifugally Cast In Metal Molds Or Sand-lined Molds, For Water or Other Liquids. Acceptable Manufacturers include: U.S. Pipe, Griffin Pipe Products, and Atlantic States Pipe.

Fittings: All Ductile Iron Fittings shall conform to the latest ANSI/AWWA Specification C110/A21.10 Gray-Iron and Ductile-Iron Fittings.

1. Fittings shall have pressure rating of 350 PSI.
2. All fittings shall be mechanical joint unless otherwise specified.
3. Bends, tees, and other fittings shall be restrained.
4. All mechanical joint fittings shall be installed using approved retained glands instead of the mechanical joint follower glands.

Acceptable manufacturers include Tyler Union, U.S. Pipe, and Star Pipe Products.

Thrust Restraint (Mechanical Joints): Mechanical joint restraint shall have a rated pressure of 350 PSI. Acceptable manufacturers / products include EBBA Megalug 1100 Series, Ford Uni-Flange Series 1400, and Star Pipe Stargrip Series 3000.

Thrust Restraint (Push-on): Push-on joint restraint shall have a rated pressure of 350 PSI. Acceptable manufacturers / products include EBBA 1700 Series, Ford Uni-Flange Series 1450, and Star Pipe Series 3100P.

Thrust Restraint (Thrust Blocks): Use of thrust blocks for thrust restraint will generally not be permitted. Use of thrust blocks must be approved by the Engineer and MDC on a case by case basis.

The minimum restrained lengths shall be as provided in the table below:

<u>FITTING</u>	<u>RESTRAINT LENGTH</u>
12" – 45° Bend	13-feet in each Direction
8" – 45° Bend	9-feet in each Direction
6" & 4" - 45° Bend	7-feet in each Direction
12" – 22-1/2° Bend	6-feet in each Direction
10" - 45° Bend	11-feet in each Direction
8" - 90° Bend	23-feet in each Direction
8" – 22-1/2° Bend	4-feet in each Direction
8" – 11-1/4° Bend	2-feet in each Direction
6" & 4" – 22-1/2° Bend	3-feet in each Direction
6" & 4" – 11-1/4° Bend	2-feet in each Direction
12" – 11-1/4° Bend	3-feet in each Direction
12" Vertical Offset	
Upper 45° Bend	27-feet in each Direction
Lower 45° Bend	12-feet in each Direction
8" Vertical Offset	
Upper 45° Bend	19-feet in each Direction
Lower 45° Bend	8-feet in each Direction
6" & 4" Vertical Offset	
Upper 45° Bend	14-feet in each Direction
Lower 45° Bend	6-feet in each Direction
12" x 12" x 12" Tee	42-feet in Branch
12" x 12" x 10" Tee	29-feet in Branch
12" x 12" x 8" Tee	16-feet in Branch
12" x 12" x 6" Tee	1-foot in Branch
8" x 8" x 8" Tee	25-feet in Branch
8" x 8" x 6" Tee	10-feet in Branch
8" x 8" x 4" Tee	1-foot in Branch
6" x 6" x 6" Tee	15-feet in Branch

6" x 6" x 4" Tee	1-foot in Branch
16" x 12" Reducer	32-feet Larger Direction only
12" x 10" Reducer	28-feet Larger Direction only
12" x 8" Reducer	31-feet Larger Direction only
12" x 6" Reducer	42-feet Larger Direction only
8" x 6" Reducer	17-feet Larger Direction only
8" x 4" Reducer	29-feet Larger Direction only
6" x 4" Reducer	16-feet Larger Direction only
12" Valve or Dead-end	58-feet in each Direction
10" Valve or Dead-end	49-feet in each Direction
8" Valve or Dead-end	41-feet in each Direction
6" Valve or Dead end	31-feet in each Direction
4" Valve or Dead-end	22-feet in each Direction
2" Valve or Dead-end	18-feet in each Direction

Note: Lengths shown are based on 150 psi test pressure, 4-1/2-foot bury, soil type GP, trench Type 3, and 2:1 safety factor. Changes in conditions will require revision in lengths. A reduction in the lengths noted above will not be allowed.

Couplings: Couplings shall be ductile iron to meet or exceed ASTM A536, Grade 65-45-12. Gaskets shall comply with ASTM D2000. Bolts and nuts shall meet or exceed AWWA C111 and ASTM A242. Acceptable manufacturers/products include Ford Meter Box Series FC, JCM Industries No. 210 or No. 212, and Romac Model No. 501.

Gate Valves: Gate valves shall be resilient seated or double disc type, conforming to the requirements of AWWA C509. Acceptable manufacturers/products include Clow Series 2633/2640, Mueller 2360 Series, and Kennedy No. 8571.

Tapping Gate Valves: Tapping gate valves shall be resilient seated or double disc type, conforming to the requirements of AWWA C509. Acceptable manufacturers/products include Clow C-950 or F-6114, Mueller T2360 Series, and Kennedy No. 8950.

Gate Boxes: Gate boxes shall be adjustable, two-piece - "Dwyer" style, and comply with ASTM A48. Cover shall be marked "Water." Acceptable manufacturers/products include Bibby-Ste-Croix, Bingham and Taylor, and EJ USA, Inc.

Butterfly Valves: Butterfly valves shall meet AWWA C504. Acceptable manufacturers/products include Clow 4500, Mueller Linesal 111 150B or Linesal XPII 250B, and Pratt Groundhog.

Tapping Sleeve: Tapping sleeves shall be all stainless steel, including flange. Acceptable manufacturers/products include Ford Meter Box Style FTSS or FAST, Mueller H304, and Smith Blair Models 663 or 665.

Hydrant: Hydrants shall comply with AWWA Standard C502 and ULFM C550. Hydrants shall red with yellow bonnet. Hydrants shall open counterclockwise and shall have two 2 1/2" nozzles and one 4 1/2" nozzle. Acceptable manufacturers/products include Mueller A-423 Super Centurion 250, Kennedy Valve K-81-A,d, and American Darling Valve B-84-B5.

Underground Warning Tape: Detectable warning tape shall be acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep. Warning tapes shall be solid blue film with continuously printed black-letter caption "CAUTION--WATER LINE BURIED BELOW."

Trench Excavation: Furnish materials and products required for safe and effective bracing and shoring of the trench excavation.

Water Main Bedding: Comply with Form 816, Article M.03.01 - Item 2 (FINE AGGREGATE).

Disinfection and Flushing: Provide all tools, power, materials, and chemicals necessary to disinfect, test, flush, and de-chlorinate the water main and appurtenances, in conformance with AWWA Standards C600 and C651 and Standards stated in Section 19-13-B102 of Regulations of Connecticut State Agencies.

Pressure Testing: Provide all tools, materials, test plugs, caps, pumps, pipe connections, water meter, pressure gauges, and other equipment required to perform pressure and leakage testing in conformance with AWWA Standard C600.

The gauge used in the pressure and leakage testing apparatus shall be a minimum of 4-inches in diameter and pressure increments shall not exceed 2 P.S.I.

Construction Methods:

Water main installation shall conform to the Metropolitan District (MDC) standards and AWWA Standard C600, latest revision. The Contractor shall coordinate all inspections of installations with the Engineer and MDC. The Contractor shall not backfill until installation is approved by the Engineer and MDC. The following additions shall apply in regard to Construction Methods:

Handling and Distribution of Pipe, Fittings and Valves: The pipe, fitting, and valves shall be handled and protected during loading, transporting, and unloading operations in such manner as to avoid damage. Pipe, fittings, valves and hydrants shall be lowered carefully into the trench using a backhoe, a crane, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench nor shall they be permitted to roll against pipe already on the ground. Insofar as practicable, each piece of pipe shall be delivered and unloaded near the place where it is to be installed and readily inspected by the Engineer and where it will not interfere with excavation operations, traffic, or access by adjacent property owners. If this is not possible, the pipe, fittings and valves shall be stored in a safe area as close to the job site as possible. The Contractor is responsible for identifying a location for storage of pipe, fittings, valves, and excavated material. All damaged pipe, fittings, and valves will be rejected and such rejected pipe, fittings, and valves shall be removed from the site. In the event of slight damage to the coating or lining, the Engineer may permit the damage to be repaired at the site. Such repairs shall be made at the Contractor's expense.

Laying Ductile Iron Pipe: All pipe installation shall conform to AWWA Standard C600, latest revision, unless otherwise modified by these Specifications.

1. Ductile iron pipe shall be laid to the minimum depths shown on the Contract plans unless otherwise directed. Where pipe is installed at less than the required cover, the Contractor shall install insulation. Water mains shall be installed with minimum clearances from sanitary sewers of 10' horizontally and 18" vertically. Where the pipeline crosses existing utilities, a vertical clearance of twelve inches (12") minimum shall be maintained, except for sanitary sewers and storm drains where at least eighteen inches (18") of vertical clearance shall be maintained. The pipe between bell holes shall bear continuously on clean fill. If the Contractor excavates below the required limit, the trench bottom shall be brought to the required grade with an approved backfill of gravel, sand or crushed stone at the Contractor's expense. In laying pipe, the deflections shall not exceed 75% of the deflection given in AWWA Standard C600 latest revision.
2. All pipe fittings and valves shall be lowered carefully into the trench by means of mechanical equipment in such a manner as to prevent them from being damaged. The insides of all bells and outsides of spigots shall be wiped clean and dry and shall be free from oil or grease. During the laying of the pipe, extra care shall be taken to see that no dirt, debris, tools, clothing, or other illicit materials are allowed to be left in the pipeline.
3. After the pipe is laid in the trench, the spigot end shall be centered in the bell and forced home. Under no circumstances shall pipe be laid where there is water in the trench. The Contractor shall install and joint the pipe in accordance with the manufacturer's instructions.
4. Bends, tees, and other fittings shall be restrained, all joints within 16-feet of any fitting or bend less than 45-degrees, all joints within 32-feet of any fitting or bend 45-degrees and less than 90-degrees, and all joints within 80-feet of any fitting or bend of 90-degrees shall be restrained. Ductile iron pipe shall be laid flat on the solid trench bottom and not on blocks. It shall not be poured or cemented solidly into concrete walls or foundations. Mechanical joint pipe or push on joint pipe may be used. All fittings shall be mechanical joint unless otherwise specified.
5. When necessary to cut pipe in the field, the cutting shall be done such that neither the pipe nor the lining shall be damaged and such that a smooth, right angle to axis cut is made. A machine designed for this purpose shall be used for the cutting.
6. Terminate water-service piping at a point 5'-0" off of the foundation wall of buildings until building water piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building water piping systems when those systems are installed.
7. At all times when pipe laying is not actually in progress, the open ends of the pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the

trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

Hydrant Installation: The Contractor shall furnish and install fire hydrants and appurtenant piping, gate valves, restrained joints, hydrant tees, thrust blocks, drainage aggregate, magnetic indicating tape, and all other related fittings and work as shown on the Contract plans or described herein. The Contractor shall provide combined pressure and leakage tests on the new fire hydrant assemblies in conformance with AWWA Standard C600. Additionally, the Contractor is required to disinfect the fire hydrant assemblies in conformance with AWWA Standards C600 and C651 and Standards stated in Section 19-13-B102 of Regulations of Connecticut State Agencies. There will be no separate payment for performing pressure, leakage and disinfection of the hydrant assemblies, but this work will be included for payment under this section.

1. Hydrant installations shall conform to the Contract plans.
2. All hydrant installations are to be restrained from the branch to the hydrant with approved methods, i.e., rods, retainer glands, or hydrant anchoring tee, or a combination of these.
3. All hydrants, prior to their acceptance and placing in service, shall: have concrete collars installed around the barrel, below grade, as indicated on the hydrant detail, be painted according to MDC standards (barrel – red, cap – yellow); and have cap chains in place.

Trench Excavation: Excavation and backfilling shall be performed as described herein and in accordance with Article 2.05.03 of Form 816.

Bank gravel shall be suitable material for backfilling trenches. Bank gravel shall conform to the requirements of Form 816, Article M.02.01-2.

Warning tape shall be placed approximately 2' above the pipe. The trenches shall be refilled in 6 inch layers at least to a level 12" above the top of the pipe with bank run gravel, compacted in accordance with the requirements below, each layer to be leveled and thoroughly compacted to the satisfaction of the Engineer and MDC before the next layer is deposited. Backfilling shall be done in a manner which will prevent subsequent settlement and injury to the pipe.

Each layer of material shall be compacted by the use of vibratory compaction equipment or rollers or other means to achieve the required compaction. At such points as cannot be reached by mobile mechanical equipment, the materials shall be thoroughly compacted by the use of suitable power-driven tampers.

All backfill material shall be compacted to at least the specified percent maximum density as determined by ASTM D1557 Method C:

<u>LOCATION</u>	<u>PERCENT MAXIMUM DENSITY</u>
Below pipe centerline	95

Above pipe centerline (below unpaved surface)	92
Above pipe centerline (below paved surface)	95
Embankments	92
Below pipe in embankments	95
Below structures	95

Previously placed or new materials shall be moistened by sprinkling, if required to ensure proper bond and compaction. No compacting shall be done when the material is too wet, from wither rain or too great an application of water, to compact it properly; at such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction. The water content of the soil shall be adjusted by wetting or drying as may be necessary to obtain proper compaction.

Bedding: Bedding materials shall comply with Form 816, Article M.03.01 - Item 2 (SAND). Sand bedding material shall be placed under and around water mains and fittings for support and protection. Sand bedding material shall be placed in layers of not more than 6 inches in depth after compaction. The water main shall be installed in sand bedding material, with a thickness directly under the pipe of 6 inches and preshaped to a height of 10 percent of the total height of the pipe. After the pipe has been installed, the trench shall be backfilled with sand bedding material to a height of 12 inches above the top of the water main.

Cleaning and Inspection of Pipe, Hydrants, Fittings and Valves: The insides of pipes, fittings, and valves shall be thoroughly cleaned before installation and shall be kept clean until accepted in the completed work. Whenever the work is interrupted, all open ends of pipe shall be temporarily closed by water tight plugs. No trench water shall be permitted to enter the pipe. All pipe and special casting shall be carefully examined for defects and no pipe or special casting shall be laid which is known to be defective. If any such pipe or casting is discovered to be defective after placement, it shall be removed and replaced with a sound pipe or casting by the Contractor at its expense.

All underground pipe in fire services and all pipe before the meters in domestic services shall be pressure tested in the presence of the Engineer and MDC at a pressure of 150 pounds per square inch for domestic and 200 pounds per square inch for fire services.

Fire pressure tests may also require witnessing by the authority having jurisdiction.

Installation of Valves: Valve boxes shall be set carefully, truly vertical, and accurately centered over the operating nut with the top set at roadway or existing ground surface grade.

Ductile Iron Fittings: Comply with AWWA Standard C600. Restrain mechanical joints at all fittings as described elsewhere in this specification.

Gate Valves (12 inches and smaller): Comply with AWWA Standards C600, C500-Appendix A, and C509 Appendix A. Restrain mechanical joints at gate valves as described elsewhere in this specification

Thrust Restraint: Where and as show on the drawings or as directed by the Engineer or MDC retaining glands, eye bolts and lacing rods shall be installed, in accordance with the details.

When using mechanical joint retainer gland method of, retaining glands shall be installed as directed in lieu of the standard mechanical joint gland. The “T” bolts shall be tightened with a ratchet or torque wrench to between 75 and 90 foot-pounds. Only then shall the set screws be tightened 180 degrees apart to a maximum of 70 foot-pounds. Once all set screws have been tightened a final check with the torque wrench shall be made to ascertain that all set screws have 70 foot-pounds. The joint is then complete. Torque settings shall be done with the pipe laid in place.

When using restraining push on joints, either mechanical joint glands and lacing rods or retaining glands shall be used. Lacing rods, nuts and bolts shall be coated in the field with an approved coating to protect them from corrosion.

Blow-offs: All blow-offs installed to the road surface are to be 4” ductile or cast iron pipe with the proper reducer.

All components of the blow-off assembly, including the gate valve, reducer and 90 degree bend are to be restrained together with approved methods.

All blow-offs shall be separated from the gate valve by one full length of pipe or a minimum distance of 15 feet whenever possible. In certain cases there may be exceptions based on practicality of the installation and physical restraints such as green belts in cul-de-sacs, driveways and conflicting utilities, therefore this separating distance may be reduced to 10 feet with the approval of MDC.

Pipe Joint Protection: Furnish and install repair clamps where indicated on the Contract plans or directed by the Engineer. Install repair clamps in strict compliance with manufacturer’s instructions.

Sterilization: The Contractor, in cooperation with MDC forces, shall sterilize the new water service pipelines and sections thereof by using a modification of the Tablet Method as described in Section 5.1 of the latest edition of ANSI/AWWA C651, “Standard for Disinfecting Water Mains.” The appropriate number of five (5) gram calcium hypochlorite tablets as shown in Table 1 shall be cemented in each length of pipe by the Contractor. Tablets are to be attached by an adhesive such as Permatex No 2c to the top of each pipe. Subsequent to the completion of the water service lines, they shall be filled with water as part of the tablet method of sterilization. The water shall remain in the pipelines a minimum of 24 hours before flushing.

After final flushing and before placing the water service pipelines in service, MDC forces will make appropriate bacteriological tests. If the water service fails these tests, MDC will require additional sterilization, flushing and testing. All expense for this additional work will be the responsibility of the Contractor.

Note: Fire Services are not required to be sterilized.

Table 1
Number of 5 gram Hypochlorite tablets required for 50 ppm dose

PIPE DIAMETER (INCHES)	NUMBER OF TABLETS PER LENGTH OF PIPE	
	18'	20'
4"	1	1
6"	1	1
8"	2	2
10"	3	3
12"	4	4

The complete test procedure requires four (4) consecutive working days for the results to be obtained.

CAUTION: Tablets are not to be left in pipe above ground over night or on the job site where they can come in contact with children or animals.

Flushing: The Contractor shall make arrangements with MDC to flush the system subsequent to sterilization. The MDC will be responsible for opening the gate valves in the street if necessary, and to supply the materials for neutralizing the chlorine. The Contractor shall be responsible for supplying equipment necessary to perform the flushing operation and determining where the water will drain during the flushing operation so as not to flood areas or cause damage to property.

Hydrostatic and Leakage Testing: Perform hydrostatic and leakage testing in requirements with MDC requirements.

Measurement and Payment:

The quantity to be paid for under ITEM # 1301080A 4" DUCTILE IRON PIPE (WATER MAIN) shall be the actual number of linear feet of 4" ductile iron pipe furnished, installed and accepted as shown on the Contract plans and specified herein.

The quantity to be paid for under ITEM # 1301083A 10" DUCTILE IRON PIPE (WATER MAIN) shall be the actual number of linear feet of 10" ductile iron pipe furnished, installed and accepted as shown on the Contract plans and specified herein.

The quantity to be paid for under ITEM # 1301084A 12" DUCTILE IRON PIPE (WATER MAIN) shall be the actual number of linear feet of 10" ductile iron pipe furnished, installed and accepted as shown on the Contract plans and specified herein.

The quantity to be paid for under ITEM # 1303204A HYDRANT ASSEMBLY (WATER MAIN) shall be the actual number of hydrant assemblies furnished, installed and accepted as shown on the Contract plans and specified herein.

Basis of Payment:

ITEM # 1301080A 4" DUCTILE IRON PIPE (WATER MAIN) shall be paid for at the Contract Unit price per linear foot of 4-inch ductile iron pipe complete in place, which price shall include all labor, materials, tools, equipment and work incidental thereto. Additionally, the linear foot price shall include connection to existing pipe, all fittings, adapters, valves, tapping sleeves, corporation stops, curb stops, curb boxes, saddles, thrust restraints, joint protection, rigid foam insulation, warning tape, and the temporary termination of water-service piping at a point 5'-0" off of the foundation wall of buildings until building water piping systems are installed. Care and protection of existing pipes, utilities, and other structures; trench excavation and backfill; disposal of excess materials; dewatering; furnishing and placing bedding; and all other work shown or specified for furnishing, installing, disinfecting, flushing and testing the 4-inch ductile pipe as shown on the Contract plans and specified herein is also included.

ITEM # 1301083A 10" DUCTILE IRON PIPE (WATER MAIN) shall be paid for at the Contract Unit price per linear foot of 10-inch ductile iron pipe complete in place, which price shall include all labor, materials, tools, equipment and work incidental thereto. Additionally, the linear foot price shall include all fittings, adapters, valves, tapping valves, corporation stops, curb stops, curb boxes, saddles, thrust restraints, joint protection, rigid foam insulation, and warning tape. Care and protection of existing pipes, utilities, and other structures; trench excavation and backfill; disposal of excess materials; dewatering; furnishing and placing bedding; and all other work shown or specified for furnishing, installing, sterilizing, flushing and testing the 10-inch ductile pipe as shown on the Contract plans and specified herein is also included.

ITEM # 1301084A 12" DUCTILE IRON PIPE (WATER MAIN) shall be paid for at the Contract Unit price per linear foot of 12-inch ductile iron pipe complete in place, which price shall include all labor, materials, tools, equipment and work incidental thereto. Additionally, the linear foot price shall include all fittings, adapters, valves, corporation stops, curb stops, curb

boxes, saddles, thrust restraints, joint protection, rigid foam insulation, warning tape, and the temporary termination of water-service piping at a point 5'-0" off of the foundation wall of buildings until building water piping systems are installed. Care and protection of existing pipes, utilities, and other structures; trench excavation and backfill; disposal of excess materials; dewatering; furnishing and placing bedding; and all other work shown or specified for furnishing, installing, sterilizing, flushing and testing the 12-inch ductile pipe as shown on the Contract plans and specified herein is also included.

ITEM # 1303204A HYDRANT ASSEMBLY (WATER MAIN) shall be paid for at the Contract Unit price for each hydrant assembly, complete in place, which price shall include all labor, materials, tools, equipment and work incidental thereto. Additionally, the price shall include furnishing and installing the hydrant tee, gate valve and valve box, 6-inch ductile iron pipe, hydrant, offset or bends if required, mechanical joint retainer glands, push-on pipe joint retainers, drainage stone and thrust block and pre-cast concrete supports as shown on the Contract plans and specified herein. Care and protection of existing pipes and utilities, and other structures; trench excavation; disposing of excess materials; dewatering; furnishing and placing bedding and all other work shown or specified for furnishing, installing, sterilizing, and flushing as shown on the Contract plans and specified herein is also included

<u>Pay Item</u>	<u>Pay Unit</u>
4" Ductile Iron Pipe (Water Main)	LF
10" Ductile Iron Pipe (Water Main)	LF
12" Ductile Iron Pipe (Water Main)	LF
Hydrant Assembly (Water Main)	EA

ITEM #1400101A – 6” POLYVINYL CHLORIDE PIPE (SANITARY SEWER)

ITEM #1400102A – 8” POLYVINYL CHLORIDE PIPE (SANITARY SEWER)

ITEM #1400103A – 10” POLYVINYL CHLORIDE PIPE (SANITARY SEWER)

Description:

This item shall consist of furnishing all labor, materials, tools and equipment necessary to install polyvinyl chloride (pvc) pipe of the size indicated and at the locations shown on the plans to a point 5 feet off the building and to all other connections shown on the plans, including existing buildings, manholes and pump stations.

Submit the following in accordance with Form 816 Article 1.20-1.05.02 and NOTICE TO CONTRACTOR – SUBMITTALS.

1. Product Data for all materials.

Quality Assurance: Materials and installation of polyvinyl chloride pipe shall be in accordance with the Metropolitan District (MDC) policies and these Specifications.

Coordination:

Coordinate sanitary sewer service connections to components furnished by the MDC

1. Coordinate installation and connection of exterior and underground utilities and services.
2. Comply with requirements of authorities having jurisdiction and utility company providing sanitary sewer and other services.

Sanitary sewer service connection work provided by others:

1. The MDC will inspect the installation of the extension of the gravity sewer and force main located in Brook Street. The contractor shall provide all excavation, materials and backfill required for the sewer and force main installation.

Contacts:

The Metropolitan District (MDC)
555 Main Street
Hartford, CT 06142
Attention: Utility Services
860-278-7850 x3703

2. A charge of \$155,000 shall be included in the contract bid price for the service connection to the facilities by the utility company. All Contractors will include the above amount for utility service charges in the Contract Bid Price. If it is determined that different charges apply, the Contractor's bid will be adjusted to reflect the differential by

construction order, provided that the Contractor provides all applicable written billing documentation. The Contractor will be compensated only for the difference between the billed amount and the estimated amount. No additional Contractor markup will be allowed.

3. The Contractor shall call "Call Before You Dig!" at (800) 922-4455 before any excavation takes place. Contractor shall coordinate excavation with paving operation.

Materials:

General: All materials shall conform to the Metropolitan District (MDC) Material Specifications.

Solid-Wall PVC Pipe: ASTM D 3034, SDR 35. Acceptable Manufacturers include: National Pipe, JM Mfg., and IPEX.

PVC Fittings: ASTM F 1336 and ASTM D 3034, SDR 35 gasketed sewer fittings. Acceptable Manufacturers include: National Pipe, JM Mfg., and IPEX.

Bedding: Bedding material shall comply with the requirements of Subarticle M.08.01-21.

Construction Methods:

General: Installation of polyvinyl chloride pipe shall conform to the Metropolitan District (MDC) standards and these specifications.

Do not store plastic pipe and fittings in direct sunlight. Protect pipe, pipe fittings, and seals from dirt and damage. Support during storage to prevent sagging and bending.

PVC Pipe: Basic piping joint construction is specified in CSI Division 22 Section 220500, "Common Work Results for Plumbing". Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

1. Install piping in accordance with ASTM D 2321.
2. Make changes in direction using appropriate branches, bends, and long sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of piping in direction of flow is prohibited.
3. All PVC pipe shall have retained gaskets, O-rings are not allowed.
4. Minimum depth of cover shall be 3.5'.
5. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

Excavation: Excavation and backfilling shall be performed as described herein and in accordance with Article 2.05.03 of Form 816.

Bedding: Placement of bedding material shall comply with Form 816 Section 6.51.

Testing:

All installed piping shall be pressure tested in accordance with MDC requirements. A report acceptable to the MDC shall be submitted.

All installed piping shall be video inspected. A report acceptable to the MDC shall be submitted.

Method of Measurement:

This work will be measured for Payment by the actual number of linear feet of polyvinyl chloride pipe of the size specified, installed and accepted. The work will include all trench excavation, bedding material and backfill. The work will also include the connection to new and existing manholes as may be necessary for a complete and functioning installation.

Basis of Payment:

This work will be paid for at the unit price per linear foot of “(size) Polyvinyl Chloride Pipe (Sanitary Sewer)” complete in place, which shall include all material, equipment, tools, excavation and backfill, and labor incidental thereto.

Pay Item

6” Polyvinyl Chloride Pipe (Sanitary Sewer)
8” Polyvinyl Chloride Pipe (Sanitary Sewer)
10” Polyvinyl Chloride Pipe (Sanitary Sewer)

Pay Unit

L.F.
L.F.
L.F.

ITEM #0202323A -REUSE STOCKPILE STRUCTURAL FILL

Description:

Work under this item shall consist of furnishing and placing reuse stockpile structural fill where shown on the plans or directed by the Engineer.

Materials: Reuse stockpile structural fill shall consist of on-site, excavated material stockpiled for reuse (location as shown the plans), blended thoroughly with No.4 crushed or broken stone (per M.O.I.OI). The composition of the reuse stockpile structural fill shall be 90% reuse stockpile material and 10% No.4 crushed or broken stone by weight. Reuse stockpile structural fill shall meet the following gradation;

<u>Square Mesh Sieves</u>	<u>% Passing (by weight)</u>
100mm	100
37.5mm	55 to 100
19mm	40 to 90
No.4	20 to 85
No. 40	0 to 70
No. 200	0 to 15

Construction Methods:

Areas to place the reuse stockpile structural fill will be delineated and defined on the plans or as directed by the Engineer. Reuse stockpile material shall not be placed above the proposed vapor barrier. The Contractor shall submit to the Engineer, for his approval, a proposal describing the methods to blend, place and protect the reuse stockpile structural fill. No material will be placed by the Contractor outside of the defined limits.

Prior to the start of placement, all temporary vegetation on the existing reuse stockpile shall be removed and shall not be used to create reuse stockpile structural fill. An initial test stockpile of 2,000 CY of reuse stockpile structural fill shall be sampled and tested using AASHTO T27 and AASHTO T11 to confirm the Contractor's means and methods will produce the required material. The material will then be sampled and tested once per each 3,000 CY of reuse stockpile structural fill blended.

The Contractor shall, when necessary, in reuse stockpile structural fill placement or stockpile areas, provide and maintain ditches which are adequate to prevent surface runoff from flowing into or out of the reuse stockpile structural fill.

After all excavation has been completed, reuse stockpile structural fill shall be deposited in layers not exceeding 8 inches (200 millimeters) in depth over the areas. In exceptional cases, the Engineer may permit the first layer to be thicker than 8 inches (200 millimeters). Each layer shall

be leveled off by the use of blade graders or bulldozers with adequate power for the work involved. The entire area of each layer shall be compacted by use of vibratory, pneumatic-tired or tread-type compaction equipment approved by the Engineer. Special attention shall be given to compaction in places close to walls and footings where motorized vehicular equipment cannot reach. Within 3 feet of the back face of walls and footings each layer shall be compacted only by mechanical rammers, vibrators or pneumatic tampers. Compaction shall be continued until the dry density over the entire area of each layer is not less than 95% of the dry density achieved by AASHTO T180, Method D. If a layer is formed from reclaimed miscellaneous aggregate containing bituminous concrete, the wet density after compaction on this layer shall not be less than 95% of the wet density for that reuse stockpile structural fill when tested in accordance with AASHTO T180, Method D. In this test, material retained on the 3/4-inch (19-millimeter) sieve shall be replaced with material retained on the No.4 (4.75-millimeter) sieve, as noted as an option in the specifications for this testing.

Each layer of reuse stockpile structural fill shall be compacted at optimum moisture content. No subsequent layer shall be placed until the specified compaction is obtained for the previous layer.

Where the plans call for compacted granular fill adjacent to the reuse stockpile structural fill, the materials shall be placed simultaneously, and at no time shall there be a difference of more than 2 feet (600 millimeters) in elevation of the two classes of material.

Method of Measurement:

Reuse stockpile structural fill will be measured in place after compaction, by the average area end method.

Basis of Payment:

This work will be paid for at the contract unit price per cubic yard (cubic meter) for "Reuse Stockpile Structural Fill," complete in place, which price shall include all materials, excavation of stockpiled material, equipment, tools and labor incidental thereto.

The cost of water and work involved in puddling, admixtures and protective materials shall be included in the contract unit price per cubic yard (cubic meter) for "Reuse Stockpile Structural Fill."

<u>Pay Item</u>	<u>Pay Unit</u>
Pumping Station (Sanitary Sewer)	LS

ITEM #0210100A - ANTI –TRACKING PAD

Description:

Work under this item shall consist of furnishing, installing, maintaining and removing a crushed stone anti-tracking pad on filter fabric at the location shown on the plans or ordered by the Engineer.

Materials:

Materials for this work shall conform to the requirements of Article M.01.01, for No.3 crushed stone, and M.08.01-19 for geotextile filter fabric.

Construction Methods:

Clear area of anti-tracking pad of all vegetation and excavate to a minimum depth of 6". Place filter fabric over the full width and length of excavated area and cover with crushed stone to a depth of no less than 6".

The anti-tracking pad shall be uniformly graded to produce the entry and exit path to the site for all construction equipment. The pad shall be maintained of sufficient grading and stone surface to capture all soils and sediment from equipment tires prior to such exiting from the site.

Stone shall be replenished or replaced as necessary or as ordered by the Engineer to ensure sufficient capture of sediment at the Project Site. Any sediment tracked off the site shall be immediately cleaned, swept and removed by the Contractor at no cost to the State.

Method of Measurement:

This work will be measured for payment by the number of square yards of accepted anti-tracking pad completed as shown on the plans or ordered by the Engineer.

Basis of Payment:

This work will be paid for at the contract unit price per square yard for "Anti-Tracking Pad," complete which price shall include furnishing, placing, maintaining, and removing all materials, equipment, tools and labor incidental thereto.

Pay Item

Anti-Tracking Pad

Pay Unit

SY

ITEM # 0406999A - ASPHALT ADJUSTMENT COST

The Asphalt Price is available on the Department of Transportation web site at:

<http://www.ct.gov/dot/asphaltadjustment>

The asphalt adjustment cost will be based on the variance in price for the performance-graded binder component of hot mix asphalt (HMA), Polymer Modified Asphalt (PMA), and Ultra-Thin Bonded Hot-Mix Asphalt mixtures completed and accepted in the contract.

An asphalt adjustment cost will be applied only if all of the following conditions are met:

- I. For HMA and PMA mixtures:
 - a. The HMA or PMA mixture in which the adjustment is being applied is listed as a contract item with a pay unit of tons or metric tons.
 - b. The total quantity for all HMA and PMA mixtures in a contract or individual purchase order (Department of Administrative Service contract awards) exceeds 1000 tons or more.
 - c. The difference between the posted Asphalt Base Price and Asphalt Period Price varies by more than \$5.00.
- II. For Ultra-Thin Bonded HMA mixtures:
 - a. The Ultra-Thin Bonded HMA mixture in which the adjustment is being applied is listed as a contract item.
 - b. The total quantity for Ultra-Thin Bonded HMA mixture in a contract exceeds:
 - i. 800 tons (727 metric tons) if Ultra-Thin Bonded HMA is listed as a contract item with a pay unit of tons or metric tons.
 - ii. 30,000 square yards (25,080 square meters) if Ultra-Thin Bonded HMA is listed as a contract item with a pay unit of square yards or square meters.

Note: The quantity of Ultra-Thin Bonded HMA measured in tons shall be determined from the material documentation requirements set forth in the Ultra-Thin Bonded HMA Special Provision.
 - c. The difference between the posted Asphalt Base Price and Asphalt Period Price varies by more than \$5.00.
 - d. No Asphalt Adjustment Cost shall be applied to the liquid emulsion that is specified as part of the Ultra-Thin Bonded HMA mixture system.

- III. Regardless of the binder used in all HMA and/or PMA mixtures, the Asphalt Adjustment Cost will be based on PG 64-22.

The Connecticut Department of Transportation (ConnDOT) shall post on its website, the average per ton selling price (asphalt price) of the performance-graded binder. The average is based on the high and low selling price published in the most recent available issue of the **Asphalt Weekly Monitor®** furnished by Poten & Partners, Inc. under the “East Coast Market – New England, New Haven, Connecticut area”, F.O.B. manufacturer’s terminal.

The selling price furnished from the Asphalt Weekly Monitor ® is based on a standard ton (US\$/ST). The metric ton price is determined by applying a factor of 1.1023 (US\$/ST x 1.1023 = US\$/mton). Example: \$150.00/ton x 1.1023 = \$165.34/mton

Formula:
$$\text{HMA} \times \frac{\text{PG}\%}{100} \times [(\text{Period Price} - \text{Base Price})] = \$ \text{ ______ }, \text{ where}$$

- **HMA:**

1. For HMA, PMA, and Ultra-Thin Bonded HMA mixtures with pay units of mass:
The quantity (tons or metric tons) of accepted HMA, PMA, or Ultra-Thin Bonded HMA mixture measured and accepted for payment.
2. For Ultra-Thin Bonded HMA mixtures with pay units of area:
The quantity of Ultra-Thin Bonded HMA mixture delivered, placed, and accepted for payment, calculated in tons or metric tons as documented according to the Material Documentation provision (section E) of the Ultra-Thin Bonded HMA Special Provision.

- **Asphalt Base Price:** The asphalt price that is posted on the ConnDOT website 28 days before the actual bid opening posted.

- **Asphalt Period Price:** The asphalt price that is posted on the ConnDOT website for the period in which the HMA, PMA mixture is placed.

- Performance-Graded Binder percentage (**PG%**)

1. For HMA or PMA mixes:

PG% = 4.5

- For Superpave 37.5mm (1.5 inch), Superpave 25.0mm (1.0 inch), PMA S1, HMA S1, and Class 4

PG % = 5.0

- For Superpave 12.5mm (0.50 inch), HMA S0.5 and Class 1.

PG % = 6.0

- For Superpave 0.375 inch (9.5mm), HMA S0.375, Superpave 6.25mm (0.25 inch), HMA S0.25, Superpave 4.75mm (#4) and Class 2.

2. For Ultra-Thin Bonded HMA mixes:
PG% = Design % PGB (Performance Graded Binder) in the approved job mix formula, expressed as a percentage to one decimal point (e.g. 5.1%)

The adjustment shall not be considered as a changed condition in the contract because of this provision and because the Contractors are being notified before submission of bids.

Basis of Payment: The "Asphalt Adjustment Cost" will be calculated using the formula indicated above. A payment will be made for an increase in costs. A deduction from monies due the Contractor will be made for a decrease in costs.

The sum of money shown on the estimate, and in the itemized proposal as "Estimated Cost", for this item will be considered the bid price although payment will be made as described above. The estimated cost figure is not to be altered in any manner by the bidder. If the bidder should alter the amount shown, the altered figure will be disregarded and the original cost figure will be used to determine the amount of the bid for the Contract.

ITEM #0507153A – POND OUTLET STRUCTURE

Description:

Work under this item shall consist of furnishing and installing the Pond Outlet Structure, including the catchbasin structure, frame and grate, excavation, bedding and backfill, as well as the orifice plate.

Materials:

Materials for this work shall conform to the requirements of Section 5.07.02.

The orifice plate shall be constructed from $\frac{3}{4}$ " stainless steel, the bolts should be $\frac{3}{4}$ " stainless steel and conform to the requirements of Article M.06.03.

Construction Methods:

Construction methods for this work shall conform to the requirements of Section 5.07.03.

A watertight seal shall be constructed between the pond outlet structure and the orifice plate.

Method of Measurement:

This work will be measured for payment by the number of each accepted pond outlet structure completed as shown on the plans or ordered by the Engineer.

Basis of Payment:

This work will be paid for at the contract unit price per each for "Pond Outlet Structure," complete which price shall include furnishing, excavation, backfill, and all materials, equipment, tools and labor incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Pond Outlet Structure	EA.

ITEM # 0901005A – BOLLARD

Description:

Work under this item shall consist of furnishing and installing concrete filled bollards with polyethylene sleeves where indicated on the plans or as ordered by the Engineer.

Submit the following in accordance with Article 1.20-1.05.02 and NOTICE TO CONTRACTOR – SUBMITTALS.

1. Product Data: For all materials.

Materials:

Steel Bollard: Schedule 80 galvanized steel pipe, 8 inch nominal size (8.625" O.D.), conforming to the requirements of ASTM A53.

Concrete: Class F, meeting the requirements of CSI Division 03 Section 033000, "Cast-in-Place Concrete."

Bollard Cover: Bollard cover shall be yellow in color constructed from 1/4"-thick polyethylene for durability while resisting impact, damage from chemicals, and the effects of UV light. Bollard cover shall be Post Sleeve #PLS1009, as manufactured by New Pig Corporation or an approved equal.

Construction Methods:

Bollards shall be installed in the locations shown on the plans. The steel pipe shall be set plumb in concrete and then filled with concrete.

Bollard covers shall be installed in the locations shown on the plans in accordance with manufacturer recommendations

Method of Measurement:

This work will be measured for payment by the actual number of bollards installed and accepted.

Basis of Payment:

This work will be paid for at the contract unit price for each "Bollard" complete in place, which shall include all excavation, material, tools and labor incidental thereto.

Pay Item
Bollard

Pay Unit
EA

ITEM #0970007A - TRAFFICPERSON (UNIFORMED FLAGGER)

9.70.01—Description: Under this item the Contractor shall provide the services of Trafficpersons of the type and number, and for such periods, as the Engineer approves for the control and direction of vehicular traffic and pedestrians. Traffic persons requested solely for the contractor's operational needs will not be approved for payment.

9.70.03—Construction Method: Prior to the start of operations on the project requiring the use of Trafficpersons, a meeting will be held with the Contractor, Trafficperson agency or firm, Engineer, and State Police, if applicable, to review the Trafficperson operations, lines of responsibility, and operating guidelines which will be used on the project. A copy of the municipality's billing rates for Municipal Police Officers and vehicles, if applicable, will be provided to the Engineer prior to start of work.

On a weekly basis, the Contractor shall inform the Engineer of their scheduled operations for the following week and the number of Trafficpersons requested. The Engineer shall review this schedule and approve the type and number of Trafficpersons required. In the event of an unplanned, emergency, or short term operation, the Engineer may approve the temporary use of properly clothed persons for traffic control until such time as an authorized Trafficperson may be obtained. In no case shall this temporary use exceed 8 hours for any particular operation.

If the Contractor changes or cancels any scheduled operations without prior notice of same as required by the agency providing the Trafficpersons, and such that Trafficperson services are no longer required, the Contractor will be responsible for payment at no cost to the Department of any show-up cost for any Trafficperson not used because of the change. Exceptions, as approved by the Engineer, may be granted for adverse weather conditions and unforeseeable causes beyond the control and without the fault or negligence of the Contractor.

Trafficpersons assigned to a work site are to only take direction from the Engineer.

Trafficpersons shall wear a high visibility safety garment that complies with OSHA, MUTCD, ASTM Standards and the safety garment shall have the words "Traffic Control" clearly visible on the front and rear panels (minimum letter size 2 inches (50 millimeters)). Worn/faded safety garments that are no longer highly visible shall not be used. The Engineer shall direct the replacement of any worn/faded garment at no cost to the State.

A Trafficperson shall assist in implementing the traffic control specified in the Maintenance and Protection of Traffic contained elsewhere in these specifications or as directed by the Engineer. Any situation requiring a Trafficperson to operate in a manner contrary to the Maintenance and Protection of Traffic specification shall be authorized in writing by the Engineer.

Trafficpersons shall consist of the following type:

Uniformed Flagger: Uniformed Flaggers shall be persons who have successfully completed flagger training by the American Traffic Safety Services Association (ATSSA), National Safety

Council (NSC) or other programs approved by the Engineer. A copy of the Flagger's training certificate shall be provided to the Engineer before the Flagger performs any work on the project. Uniformed Flaggers shall conform to Chapter 6E, Flagger Control, in the Manual of Uniformed Traffic Control Devices (MUTCD) and shall wear high-visibility safety apparel, use a STOP/SLOW paddle that is at least 18 inches (450 millimeters) in width with letters at least 6 inches (150 millimeters) high. The paddle shall be mounted on a pole of sufficient length to be 6 feet (1.8 meters) above the ground as measured from the bottom of the sign.

Uniformed Flaggers will only be used on non-limited access highways to control traffic operations when authorized in writing by the Engineer.

9.70.04—Method of Measurement: Services of Trafficpersons will be measured for payment by the actual number of hours for each person rendering services approved by the Engineer. These services shall include, however, only such trafficpersons as are employed within the limits of construction, project right of way of the project or along detours authorized by the Engineer to assist the motoring public through the construction work zone. Services for continued use of a detour or bypass beyond the limitations approved by the Engineer, for movement of construction vehicles and equipment, or at locations where traffic is unnecessarily restricted by the Contractor's method of operation, will not be measured for payment.

Trafficpersons shall not work more than twelve hours in any one 24 hour period. In case such services are required for more than twelve hours, additional Trafficpersons shall be furnished and measured for payment. In cases where the Trafficperson is an employee on the Contractor's payroll, payment under the item "Trafficperson (Uniformed Flagger)" will be made only for those hours when the Contractor's employee is performing Trafficperson services.

Travel time will not be measured for payment for services provided by Uniformed Flaggers.

Mileage fees associated with Trafficperson services will not be measured for payment.

Safety garments and STOP/SLOW paddles will not be measured for payment.

9.70.05—Basis of Payment: Trafficpersons will be paid in accordance with the schedule described herein.

There will be no direct payment for safety garments or STOP/SLOW paddles. All costs associated with furnishing safety garments and STOP/SLOW paddles shall be considered included in the general cost of the item.

Uniformed Flagger: Uniformed flaggers will be paid for at the contract unit price per hour for "Trafficperson (Uniformed Flagger)", which price shall include all compensation, insurance benefits and any other cost or liability incidental to the furnishing of the trafficpersons ordered.

Pay Item	Pay Unit
Trafficperson (Uniformed Flagger)	Hr.

ITEM NO. 0971001A – MAINTENANCE AND PROTECTION OF TRAFFIC

Article 9.71.01 – Description is supplemented by the following:

The Contractor shall maintain and protect traffic as described by the following and as limited in the Special Provision "Prosecution and Progress":

Brook Street

The Contractor shall maintain and protect a minimum of one lane of traffic in each direction, each lane on a paved travel path not less than 11 feet in width.

Excepted therefrom will be those periods, when the Contractor is actively working, at which time the Contractor shall maintain and protect at least an alternating one-way traffic operation, on a paved travel path not less than 11 feet in width. The length of the alternating one-way traffic operation shall not exceed 300 feet and there shall be no more than one alternating one-way traffic operation within the project limits without prior approval of the Engineer.

Commercial and Residential Driveways

The Contractor shall maintain access to and egress from all commercial and residential driveways throughout the project limits. The Contractor will be allowed to close said driveways to perform the required work during those periods when the businesses are closed, unless permission is granted from the business owner to close the driveway during business hours. If a temporary closure of a residential driveway is necessary, the Contractor shall coordinate with the owner to determine the time period of the closure.

Article 9.71.03 - Construction Method is supplemented as follows:

General

Unpaved travel paths will only be permitted for areas requiring full depth and full width reconstruction, in which case, the Contractor will be allowed to maintain traffic on processed aggregate for a duration not to exceed 10 calendar days. The unpaved section shall be the full width of the road and perpendicular to the travel lanes. Opposing traffic lane dividers shall be used as a centerline.

The Contractor is required to delineate any raised structures within the travel lanes, so that the structures are visible day and night, unless there are specific contract plans and provisions to temporarily lower these structures prior to the completion of work.

The Contractor shall schedule operations so that pavement removal and roadway resurfacing shall be completed full width across a roadway (bridge) section by the end of a workday (work night), or as directed by the Engineer.

When the installation of all intermediate courses of bituminous concrete pavement is completed for the entire roadway, the Contractor shall install the final course of bituminous concrete pavement.

When the Contractor is excavating adjacent to the roadway, the Contractor shall provide a 3-foot shoulder between the work area and travel lanes, with traffic drums spaced every 50 feet. At the end of the workday, if the vertical drop-off exceeds 3 inches, the Contractor shall provide a temporary traversable slope of 4:1 or flatter that is acceptable to the Engineer.

If applicable, when an existing sign is removed, it shall be either relocated or replaced by a new sign during the same working day.

The Contractor shall not store any material on-site which would present a safety hazard to motorists or pedestrians (e.g. fixed object or obstruct sight lines).

The field installation of a signing pattern shall constitute interference with existing traffic operations and shall not be allowed, except during the allowable periods.

Construction vehicles entering travel lanes at speeds less than the posted speed are interfering with traffic, and shall not be allowed without a lane closure. The lane closure shall be of sufficient length to allow vehicles to enter or exit the work area at posted speeds, in order to merge with existing traffic.

Existing Signing

The Contractor shall maintain all existing side-mounted signs throughout the project limits during the duration of the project. The Contractor shall temporarily relocate signs and sign supports as many times as deemed necessary, and install temporary sign supports if necessary and as directed by the Engineer.

Requirements for Winter

The Contractor shall schedule a meeting with representatives from the Department including the offices of Maintenance and Traffic, and the Town/City to determine what interim traffic control measures the Contractor shall accomplish for the winter to provide safety to the motorists and permit adequate snow removal procedures. This meeting shall be held prior to October 31 of each year and will include, but not be limited to, discussion of the status and schedule of the following items: lane and shoulder widths, pavement restoration, pavement markings, and signing.

Signing Patterns

The Contractor shall erect and maintain all signing patterns in accordance with the traffic control plans contained herein. Proper distances between advance warning signs and proper taper lengths are mandatory.

**Pavement Markings -Non-Limited Access Multilane Roadways
Secondary and Local Roadways**

During construction, the Contractor shall maintain all pavement markings on paved surfaces on all roadways throughout the limits of the project.

Interim Pavement Markings

The Contractor shall install painted pavement markings, which shall include centerlines, shoulder edge lines, lane lines (broken lines), lane-use arrows, and stop bars, on each intermediate course of bituminous concrete pavement and on any milled surface by the end of the work day/night. If the next course of bituminous concrete pavement will be placed within seven days, shoulder edge lines are not required. The painted pavement markings will be paid under the appropriate items.

If the Contractor will install another course of bituminous concrete pavement within 24 hours, the Contractor may install Temporary Plastic Pavement Marking Tape in place of the painted pavement markings by the end of the work day/night. These temporary pavement markings shall include centerlines, lane lines (broken lines) and stop bars; shoulder edge lines are not required. Centerlines shall consist of two 4 inch wide yellow markings, 2 feet in length, side by side, 4 to 6 inches apart, at 40-foot intervals. No passing zones should be posted with signs in those areas where the final centerlines have not been established on two-way roadways. Stop bars may consist of two 6 inch wide white markings or three 4 inch wide white markings placed side by side. The Contractor shall remove and dispose of the Temporary Plastic Pavement Marking Tape when another course of bituminous concrete pavement is installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

If an intermediate course of bituminous concrete pavement will be exposed throughout the winter, then Epoxy Resin Pavement Markings should be installed unless directed otherwise by the Engineer.

Final Pavement Markings

The Contractor should install painted pavement markings on the final course of bituminous concrete pavement by the end of the work day/night. If the painted pavement markings are not installed by the end of the work day/night, then Temporary Plastic Pavement Marking Tape shall be installed as described above and the painted pavement markings shall be installed by the end of the work day/night on Friday of that week.

If Temporary Plastic Pavement Marking Tape is installed, the Contractor shall remove and dispose of these markings when the painted pavement markings are installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

The Contractor shall install permanent Epoxy Resin Pavement Markings in accordance with Section 12.10 entitled "Epoxy Resin Pavement Markings, Symbols, and Legends" after such time as determined by the Engineer.

TRAFFIC CONTROL DURING CONSTRUCTION OPERATIONS

The following guidelines shall assist field personnel in determining when and what type of traffic control patterns to use for various situations. These guidelines shall provide for the safe and efficient movement of traffic through work zones and enhance the safety of work forces in the work area.

TRAFFIC CONTROL PATTERNS

Traffic control patterns shall be used when a work operation requires that all or part of any vehicle or work area protrudes onto any part of a travel lane or shoulder. For each situation, the installation of traffic control devices shall be based on the following:

- Speed and volume of traffic
- Duration of operation
- Exposure to hazards

Traffic control patterns shall be uniform, neat and orderly so as to command respect from the motorist.

In the case of a horizontal or vertical sight restriction in advance of the work area, the traffic control pattern shall be extended to provide adequate sight distance for approaching traffic.

If a lane reduction taper is required to shift traffic, the entire length of the taper should be installed on a tangent section of roadway so that the entire taper area can be seen by the motorist.

Any existing signs that are in conflict with the traffic control patterns shall be removed, covered, or turned so that they are not readable by oncoming traffic.

When installing a traffic control pattern, a Buffer Area should be provided and this area shall be free of equipment, workers, materials and parked vehicles.

Typical traffic control plans 19 through 25 may be used for moving operations such as line striping, pot hole patching, mowing, or sweeping when it is necessary for equipment to occupy a travel lane.

Traffic control patterns will not be required when vehicles are on an emergency patrol type activity or when a short duration stop is made and the equipment can be contained within the shoulder. Flashing lights and appropriate trafficperson shall be used when required.

Although each situation must be dealt with individually, conformity with the typical traffic control plans contained herein is required. In a situation not adequately covered by the typical traffic control plans, the Contractor must contact the Engineer for assistance prior to setting up a traffic control pattern.

PLACEMENT OF SIGNS

Signs must be placed in such a position to allow motorists the opportunity to reduce their speed prior to the work area. Signs shall be installed on the same side of the roadway as the work area. On multi-lane divided highways, advance warning signs shall be installed on both sides of the highway. On directional roadways (on-ramps, off-ramps, one-way roads), where the sight distance to signs is restricted, these signs should be installed on both sides of the roadway.

ALLOWABLE ADJUSTMENT OF SIGNS AND DEVICES SHOWN ON THE TRAFFIC CONTROL PLANS

The traffic control plans contained herein show the location and spacing of signs and devices under ideal conditions. Signs and devices should be installed as shown on these plans whenever possible.

The proper application of the traffic control plans and installation of traffic control devices depends on actual field conditions.

Adjustments to the traffic control plans shall be made only at the direction of the Engineer to improve the visibility of the signs and devices and to better control traffic operations. Adjustments to the traffic control plans shall be based on safety of work forces and motorists, abutting property requirements, driveways, side roads, and the vertical and horizontal curvature of the roadway.

The Engineer may require that the traffic control pattern be located significantly in advance of the work area to provide better sight line to the signing and safer traffic operations through the work zone.

Table I indicates the minimum taper length required for a lane closure based on the posted speed limit of the roadway. These taper lengths shall only be used when the recommended taper lengths shown on the traffic control plans cannot be achieved.

TABLE I – MINIMUM TAPER LENGTHS

POSTED SPEED LIMIT MILES PER HOUR	MINIMUM TAPER LENGTH IN FEET FOR A SINGLE LANE CLOSURE
30 OR LESS	180
35	250
40	320
45	540
50	600
55	660
65	780

SECTION 1. WORK ZONE SAFETY MEETINGS

- 1.a) Prior to the commencement of work, a work zone safety meeting will be conducted with representatives of DOT Construction, Connecticut State Police (Local Barracks), Municipal Police, the Contractor (Project Superintendent) and the Traffic Control Subcontractor (if different than the prime Contractor) to review the traffic operations, lines of responsibility, and operating guidelines which will be used on the project. Other work zone safety meetings during the course of the project should be scheduled as needed.
- 1.b) A Work Zone Safety Meeting Agenda shall be developed and used at the meeting to outline the anticipated traffic control issues during the construction of this project. Any issues that can't be resolved at these meetings will be brought to the attention of the District Engineer and the Office of Construction. The agenda should include:
 - Review Project scope of work and time
 - Review Section 1.08, Prosecution and Progress
 - Review Section 9.70, Trafficpersons
 - Review Section 9.71, Maintenance and Protection of Traffic
 - Review Contractor's schedule and method of operations.
 - Review areas of special concern: ramps, turning roadways, medians, lane drops, etc.
 - Open discussion of work zone questions and issues
 - Discussion of review and approval process for changes in contract requirements as they relate to work zone areas

SECTION 2. GENERAL

- 2.a) If the required minimum number of signs and equipment (i.e. one High Mounted Internally Illuminated Flashing Arrow for each lane closed, two TMAs, Changeable Message Sign, etc.) are not available; the traffic control pattern shall not be installed.
- 2.b) The Contractor shall have back-up equipment (TMAs, High Mounted Internally Illuminated Flashing Arrow, Changeable Message Sign, construction signs, cones/drums, etc.) available at all times in case of mechanical failures, etc. The only exception to this is in the case of sudden equipment breakdowns in which the pattern may be installed but the Contractor must provide replacement equipment within 24 hours.
- 2.c) Failure of the Contractor to have the required minimum number of signs, personnel and equipment, which results in the pattern not being installed, shall not be a reason for a time extension or claim for loss time.
- 2.d) In cases of legitimate differences of opinion between the Contractor and the Inspection staff, the Inspection staff shall err on the side of safety. The matter shall be brought to

the District Office for resolution immediately or, in the case of work after regular business hours, on the next business day.

SECTION 3. INSTALLING AND REMOVING TRAFFIC CONTROL PATTERNS

- 3.a) Lane Closures shall be installed beginning with the advanced warning signs and proceeding forward toward the work area.
- 3.b) Lane Closures shall be removed in the reverse order, beginning at the work area, or end of the traffic control pattern, and proceeding back toward the advanced warning signs.
- 3.c) Stopping traffic may be allowed:
 - As per the contract for such activities as blasting, steel erection, etc.
 - During paving, milling operations, etc. where, in the middle of the operation, it is necessary to flip the pattern to complete the operation on the other half of the roadway and traffic should not travel across the longitudinal joint or difference in roadway elevation.
 - To move slow moving equipment across live traffic lanes into the work area.
- 3.d) Under certain situations when the safety of the traveling public and/or that of the workers may be compromised due to conditions such as traffic volume, speed, roadside obstructions, or sight line deficiencies, as determined by the Engineer and/or State Police, traffic may be briefly impeded while installing and/or removing the advanced warning signs and the first ten traffic cones/drums only. Appropriate measures shall be taken to safely slow traffic. If required, traffic slowing techniques may be used and shall include the use of Truck Mounted Impact Attenuators (TMAs) as appropriate, for a minimum of one mile in advance of the pattern starting point. Once the advanced warning signs and the first ten traffic cones/drums are installed/removed, the TMAs and sign crew shall continue to install/remove the pattern as described in Section 4c and traffic shall be allowed to resume their normal travel.
- 3.e) The Contractor must adhere to using the proper signs, placing the signs correctly, and ensuring the proper spacing of signs.
- 3.f) Additional devices are required on entrance ramps, exit ramps, and intersecting roads to warn and/or move traffic into the proper travel path prior to merging/exiting with/from the main line traffic. This shall be completed before installing the mainline pattern past the ramp or intersecting roadway.
- 3.g) Prior to installing a pattern, any conflicting existing signs shall be covered with an opaque material. Once the pattern is removed, the existing signs shall be uncovered.

- 3.h) On limited access roadways, workers are prohibited from crossing the travel lanes to install and remove signs or other devices on the opposite side of the roadway. Any signs or devices on the opposite side of the roadway shall be installed and removed separately.

SECTION 4. USE OF HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

- 4.a) On limited access roadways, one Flashing Arrow shall be used for each lane that is closed. The Flashing Arrow shall be installed concurrently with the installation of the traffic control pattern and its placement shall be as shown on the traffic control plan. For multiple lane closures, one Flashing Arrow is required for each lane closed. If conditions warrant, additional Flashing Arrows should be employed (i.e.: curves, major ramps, etc.).
- 4.b) On non-limited access roadways, the use of a Flashing Arrow for lane closures is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to use the Flashing Arrow.
- 4.c) The Flashing Arrow shall not be used on two lane, two-way roadways for temporary alternating one-way traffic operations.
- 4.d) The Flashing Arrow board display shall be in the “arrow” mode for lane closure tapers and in the “caution” mode (four corners) for shoulder work, blocking the shoulder, or roadside work near the shoulder. The Flashing Arrow shall be in the “caution” mode when it is positioned in the closed lane.
- 4.e) The Flashing Arrow shall not be used on a multi-lane roadway to laterally shift all lanes of traffic, because unnecessary lane changing may result.

SECTION 5. USE OF TRUCK MOUNTED IMPACT ATTENUATOR VEHICLES (TMAs)

- 5.a) For lane closures on limited access roadways, a minimum of two TMAs shall be used to install and remove traffic control patterns. If two TMAs are not available, the pattern shall not be installed.
- 5.b) On non-limited access roadways, the use of TMAs to install and remove patterns closing a lane(s) is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to utilize the TMAs.
- 5.c) Generally, to establish the advance and transition signing, one TMA shall be placed on the shoulder and the second TMA shall be approximately 1,000 feet ahead blocking the lane. The flashing arrow board mounted on the TMA should be in the “flashing arrow” mode when taking the lane. The sign truck and workers should be immediately ahead of

the second TMA. In no case shall the TMA be used as the sign truck or a work truck. Once the transition is in place, the TMAs shall travel in the closed lane until all Changeable Message Signs, signs, Flashing Arrows, and cones/drums are installed. The flashing arrow board mounted on the TMA should be in the “caution” mode when traveling in the closed lane.

- 5.d) A TMA shall be placed prior to the first work area in the pattern. If there are multiple work areas within the same pattern, then additional TMAs shall be positioned at each additional work area as needed. The flashing arrow board mounted on the TMA should be in the “caution” mode when in the closed lane.
- 5.e) TMAs shall be positioned a sufficient distance prior to the workers or equipment being protected to allow for appropriate vehicle roll-ahead in the event that the TMA is hit, but not so far that an errant vehicle could travel around the TMA and into the work area. For additional placement and use details, refer to the specification entitled “Type ‘D’ Portable Impact Attenuation System”. Some operations, such as paving and concrete repairs, do not allow for placement of the TMA(s) within the specified distances. In these situations, the TMA(s) should be placed at the beginning of the work area and shall be advanced as the paving or concrete operations proceed.
- 5.f) TMAs should be paid in accordance with how the unit is utilized. When it is used as a TMA and is in the proper location as specified, and then it should be paid at the specified hourly rate for “Type ‘D’ Portable Impact Attenuation System”. When the TMA is used as a Flashing Arrow, it should be paid at the daily rate for “High Mounted Internally Illuminated Flashing Arrow”. If a TMA is used to install and remove a pattern and then is used as a Flashing Arrow, the unit should be paid as a “Type ‘D’ Portable Impact Attenuation System” for the hours used to install and remove the pattern, typically 2 hours (1 hour to install and 1 hour to remove), and is also paid for the day as a “High Mounted Internally Illuminated Flashing Arrow”.

SECTION 6. USE OF TRAFFIC DRUMS AND TRAFFIC CONES

- 6.a) Traffic drums shall be used for taper channelization on limited-access roadways, ramps, and turning roadways and to delineate raised catch basins and other hazards.
- 6.b) Traffic drums shall be used in place of traffic cones in traffic control patterns that are in effect for more than a 36-hour duration.
- 6.c) Traffic Cones less than 42 inches in height shall not be used on limited-access roadways or on non-limited access roadways with a posted speed limit of 45 mph and above.
- 6.d) Typical spacing of traffic drums and/or cones shown on the Traffic Control Plans in the Contract are maximum spacings and may be reduced to meet actual field conditions as required.

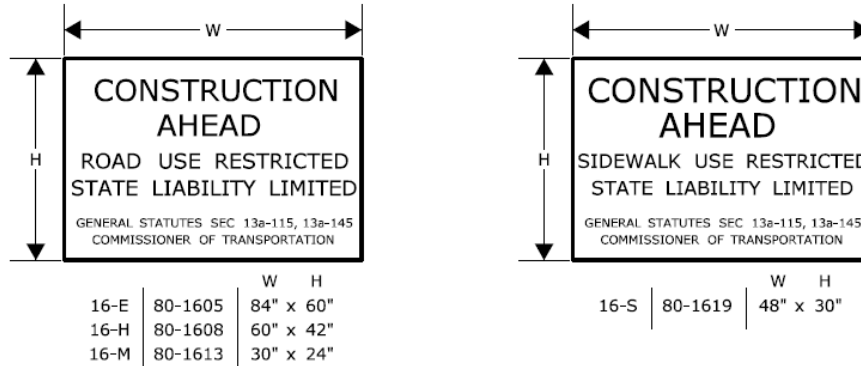
SECTION 7. USE OF (REMOTE CONTROLLED) CHANGEABLE MESSAGE SIGNS (CMS)

- 7.a) For lane closures on limited access roadways, one CMS shall be used in advance of the traffic control pattern. Prior to installing the pattern, the CMS shall be installed and in operation, displaying the appropriate lane closure information (i.e.: Left Lane Closed - Merge Right). The CMS shall be positioned ½ - 1 mile ahead of the lane closure taper. If the nearest Exit ramp is greater than the specified ½ - 1 mile distance, then an additional CMS shall be positioned a sufficient distance ahead of the Exit ramp to alert motorists to the work and therefore offer them an opportunity to take the exit.
- 7.b) CMS should not be installed within 1000 feet of an existing CMS.
- 7.c) On non-limited access roadways, the use of CMS for lane closures is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to use the CMS.
- 7.d) The advance CMS is typically placed off the right shoulder, 5 feet from the edge of pavement. In areas where the CMS cannot be placed beyond the edge of pavement, it may be placed on the paved shoulder with a minimum of five (5) traffic drums placed in a taper in front of it to delineate its position. The advance CMS shall be adequately protected if it is used for a continuous duration of 36 hours or more.
- 7.e) When the CMS are no longer required, they should be removed from the clear zone and have the display screen cleared and turned 90° away from the roadway.
- 7.f) The CMS generally should not be used for generic messages (ex: Road Work Ahead, Bump Ahead, Gravel Road, etc.).
- 7.g) The CMS should be used for specific situations that need to command the motorist's attention which cannot be conveyed with standard construction signs (Examples include: Exit 34 Closed Sat/Sun - Use Exit 35, All Lanes Closed - Use Shoulder, Workers on Road - Slow Down).
- 7.h) Messages that need to be displayed for long periods of time, such as during stage construction, should be displayed with construction signs. For special signs, please coordinate with the Office of Construction and the Division of Traffic Engineering for the proper layout/dimensions required.
- 7.i) The messages that are allowed on the CMS are as follows:

<u>Message No.</u>	<u>Frame 1</u>	<u>Frame 2</u>	<u>Message No.</u>	<u>Frame 1</u>	<u>Frame 2</u>
1	LEFT LANE CLOSED	MERGE RIGHT	9	LANES CLOSED AHEAD	REDUCE SPEED
2	2 LEFT LANES CLOSED	MERGE RIGHT	10	LANES CLOSED AHEAD	USE CAUTION
3	LEFT LANE CLOSED	REDUCE SPEED	11	WORKERS ON ROAD	REDUCE SPEED
4	2 LEFT LANES CLOSED	REDUCE SPEED	12	WORKERS ON ROAD	SLOW DOWN
5	RIGHT LANE CLOSED	MERGE LEFT	13	EXIT XX CLOSED	USE EXIT YY
6	2 RIGHT LANES CLOSED	MERGE LEFT	14	EXIT XX CLOSED USE YY	FOLLOW DETOUR
7	RIGHT LANE CLOSED	REDUCE SPEED	15	2 LANES SHIFT AHEAD	USE CAUTION
8	2 RIGHT LANES CLOSED	REDUCE SPEED	16	3 LANES SHIFT AHEAD	USE CAUTION

For any other message(s), approval must be received from the Office of Construction prior to their use. No more than two (2) displays shall be used within any message cycle.

SERIES 16 SIGNS



THE 16-S SIGN SHALL BE USED ON ALL PROJECTS THAT REQUIRE SIDEWALK RECONSTRUCTION OR RESTRICT PEDESTRIAN TRAVEL ON AN EXISTING SIDEWALK.

SERIES 16 SIGNS SHALL BE INSTALLED IN ADVANCE OF THE TRAFFIC CONTROL PATTERNS TO ALLOW MOTORISTS THE OPPORTUNITY TO AVOID A WORK ZONE. SERIES 16 SIGNS SHALL BE INSTALLED ON ANY MAJOR INTERSECTING ROADWAYS THAT APPROACH THE WORK ZONE. ON LIMITED-ACCESS HIGHWAYS, THESE SIGNS SHALL BE LOCATED IN ADVANCE OF THE NEAREST UPSTREAM EXIT RAMP AND ON ANY ENTRANCE RAMP PRIOR TO OR WITHIN THE WORK ZONE LIMITS.

THE LOCATION OF SERIES 16 SIGNS CAN BE FOUND ELSEWHERE IN THE PLANS OR INSTALLED AS DIRECTED BY THE ENGINEER.

SIGNS 16-E AND 16-H SHALL BE POST-MOUNTED.

SIGN 16-E SHALL BE USED ON ALL EXPRESSWAYS.

SIGN 16-H SHALL BE USED ON ALL RAMP, OTHER STATE ROADWAYS, AND MAJOR TOWN/CITY ROADWAYS.

SIGN 16-M SHALL BE USED ON OTHER TOWN ROADWAYS.

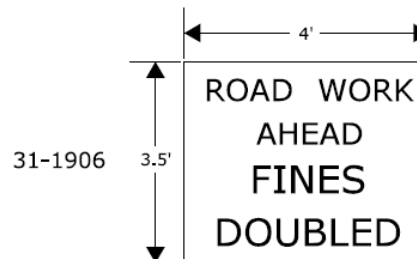
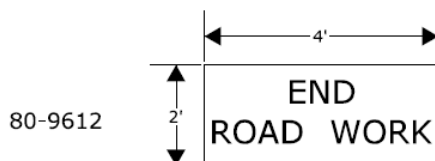
REGULATORY SIGN "ROAD WORK AHEAD, FINES DOUBLED"

THE REGULATORY SIGN "ROAD WORK AHEAD FINES DOUBLED" SHALL BE INSTALLED FOR ALL WORK ZONES THAT OCCUR ON ANY STATE HIGHWAY IN CONNECTICUT WHERE THERE ARE WORKERS ON THE HIGHWAY OR WHEN THERE IS OTHER THAN EXISTING TRAFFIC OPERATIONS.

THE "ROAD WORK AHEAD FINES DOUBLED" REGULATORY SIGN SHALL BE PLACED AFTER THE SERIES 16 SIGN AND IN ADVANCE OF THE "ROAD WORK AHEAD" SIGN.

"END ROAD WORK" SIGN

THE LAST SIGN IN THE PATTERN MUST BE THE "END ROAD WORK" SIGN.



SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN
REQUIRED SIGNS

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED

Charles S. Harlow
PRINCIPAL ENGINEER

Charles S. Harlow
2012.06.05 11:35:43-04'00'

NOTES FOR TRAFFIC CONTROL PLANS

1. IF A TRAFFIC STOPPAGE OCCURS IN ADVANCE OF SIGN (A), THEN AN ADDITIONAL SIGN (A) SHALL BE INSTALLED IN ADVANCE OF THE STOPPAGE.
2. SIGNS (AA), (A), AND (D) SHOULD BE OMITTED WHEN THESE SIGNS HAVE ALREADY BEEN INSTALLED TO DESIGNATE A LARGER WORK ZONE THAN THE WORK ZONE THAT IS ENCOMPASSED ON THIS PLAN.
3. SEE TABLE 1 FOR ADJUSTMENT OF TAPERS IF NECESSARY.
4. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 36 HOURS, THEN TRAFFIC DRUMS SHALL BE USED IN PLACE OF TRAFFIC CONES.
5. ANY LEGAL SPEED LIMIT SIGNS WITHIN THE LIMITS OF A ROADWAY / LANE CLOSURE AREA SHALL BE COVERED WITH AN OPAQUE MATERIAL WHILE THE CLOSURE IS IN EFFECT, AND UNCOVERED WHEN THE ROADWAY / LANE CLOSURE IS RE-OPENED TO ALL LANES OF TRAFFIC.
6. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 36 HOURS, THEN ANY EXISTING CONFLICTING PAVEMENT MARKINGS SHALL BE ERADICATED OR COVERED, AND TEMPORARY PAVEMENT MARKINGS THAT DELINEATE THE PROPER TRAVELPATHS SHALL BE INSTALLED.
7. DISTANCES BETWEEN SIGNS IN THE ADVANCE WARNING AREA MAY BE REDUCED TO 100' ON LOW-SPEED URBAN ROADS (SPEED LIMIT < 40 MPH).
8. IF THIS PLAN IS TO REMAIN IN OPERATION DURING THE HOURS OF DARKNESS, INSTALL BARRICADE WARNING LIGHTS - HIGH INTENSITY ON ALL POST-MOUNTED DIAMOND SIGNS IN THE ADVANCE WARNING AREA.
9. A CHANGEABLE MESSAGE SIGN SHALL BE INSTALLED ONE HALF TO ONE MILE IN ADVANCE OF THE LANE CLOSURE TAPER.
10. SIGN (P) SHALL BE MOUNTED A MINIMUM OF 7 FEET FROM THE PAVEMENT SURFACE TO THE BOTTOM OF THE SIGN.

TABLE 1 - MINIMUM TAPER LENGTHS

POSTED SPEED LIMIT (MILES PER HOUR)	MINIMUM TAPER LENGTH FOR A SINGLE LANE CLOSURE
30 OR LESS	180' (55m)
35	250' (75m)
40	320' (100m)
45	540' (165m)
50	600' (180m)
55	660' (200m)
65	780' (240m)

METRIC CONVERSION CHART (1" = 25mm)

ENGLISH	METRIC	ENGLISH	METRIC	ENGLISH	METRIC
12"	300mm	42"	1050mm	72"	1800mm
18"	450mm	48"	1200mm	78"	1950mm
24"	600mm	54"	1350mm	84"	2100mm
30"	750mm	60"	1500mm	90"	2250mm
36"	900mm	66"	1650mm	96"	2400mm



SCALE: NONE

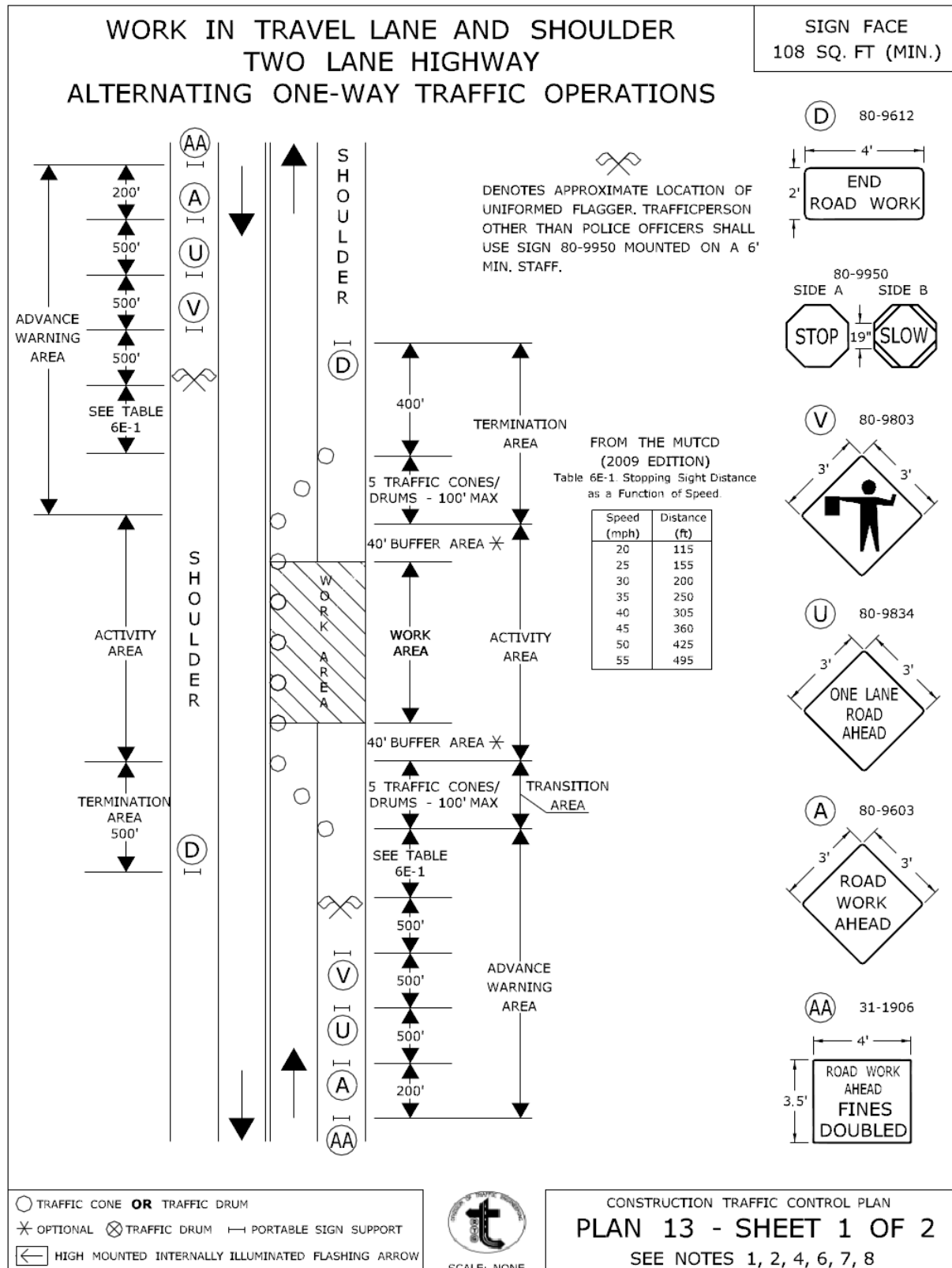
CONSTRUCTION TRAFFIC CONTROL PLAN NOTES

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED

Charles S. Harlow
PRINCIPAL ENGINEER

Charles S. Harlow
2012.06.05 15:50:35-0400



CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED

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2012.06.05 15:55:23-04'00"
PRINCIPAL ENGINEER

WORK IN TRAVEL LANE AND SHOULDER TWO LANE HIGHWAY ALTERNATING ONE-WAY TRAFFIC OPERATIONS

SIGN FACE
108 SQ. FT (MIN.)

HAND SIGNAL METHODS TO BE USED BY UNIFORMED FLAGGERS

THE FOLLOWING METHODS FROM SECTION 6E.07, FLAGGER PROCEDURES, IN THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES," SHALL BE USED BY UNIFORMED FLAGGERS WHEN DIRECTING TRAFFIC THROUGH A WORK AREA. THE STOP/SLOW SIGN PADDLE (SIGN NO. 80-9950) SHOWN ON THE TRAFFIC STANDARD SHEET TR-1220 01 ENTITLED, "SIGNS FOR CONSTRUCTION AND PERMIT OPERATIONS" SHALL BE USED.

A. TO STOP TRAFFIC

TO STOP ROAD USERS, THE FLAGGER SHALL FACE ROAD USERS AND AIM THE STOP PADDLE FACE TOWARD ROAD USERS IN A STATIONARY POSITION WITH THE ARM EXTENDED HORIZONTALLY AWAY FROM THE BODY. THE FREE ARM SHALL BE HELD WITH THE PALM OF THE HAND ABOVE SHOULDER LEVEL TOWARD APPROACHING TRAFFIC.



B. TO DIRECT TRAFFIC TO PROCEED

TO DIRECT STOPPED ROAD USERS TO PROCEED, THE FLAGGER SHALL FACE ROAD USERS WITH THE SLOW PADDLE FACE AIMED TOWARD ROAD USERS IN A STATIONARY POSITION WITH THE ARM EXTENDED HORIZONTALLY AWAY FROM THE BODY. THE FLAGGER SHALL MOTION WITH THE FREE HAND FOR ROAD USERS TO PROCEED.



C. TO ALERT OR SLOW TRAFFIC

TO ALERT OR SLOW TRAFFIC, THE FLAGGER SHALL FACE ROAD USERS WITH THE SLOW PADDLE FACE AIMED TOWARD ROAD USERS IN A STATIONARY POSITION WITH THE ARM EXTENDED HORIZONTALLY AWAY FROM THE BODY. TO FURTHER ALERT OR SLOW TRAFFIC, THE FLAGGER HOLDING THE SLOW PADDLE FACE TOWARD ROAD USERS MAY MOTION UP AND DOWN WITH THE FREE HAND, PALM DOWN.



- TRAFFIC CONE **OR** TRAFFIC DRUM
- * OPTIONAL ⊗ TRAFFIC DRUM — PORTABLE SIGN SUPPORT
- ◀ HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW



SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 13 - SHEET 2 OF 2
SEE NOTES 1, 2, 4, 6, 7, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED

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2012.06.05 15:55:45-04'00'

Article 9.71.05 – Basis of Payment is supplemented by the following:

The temporary relocation of signs and supports, and the furnishing, installation and removal of any temporary supports shall be paid for under the item “Maintenance and Protection of Traffic”. Temporary overhead sign supports and foundations shall be paid for under the appropriate item(s).

The cost of furnishing, installing, and removing the material for the 4H:1V traversable slope shall be paid for under the item “Maintenance and Protection of Traffic.”

ITEM # 0992088A – FLAGPOLE

Description:

Work under this item shall consist of furnishing and installing a flagpole with concrete foundation, complete in place, in the location shown on the plans or as approved by the Engineer.

Submit the following in accordance with Article 1.20-1.05.02 and NOTICE TO CONTRACTOR - SUBMITTALS.

1. Product Data in the form of manufacturer's technical data, specifications, and installation instructions for fittings and accessories.
2. Shop Drawings showing details of foundation and post installation.

Materials:

Flagpoles shall be as manufactured by American Flag, Bohemia, New York or an approved equal. Poles shall be tapered aluminum tubing and shall measure 40'-0" high from the finished grade. Provide standard revolving truck and cleat and 6" ball. Provide copper clad lightning rod. Flagpole foundation shall comply with manufacturer's recommendations.

Construction Methods:

Install flagpole in location shown on the plans. All materials shall be installed in strict accordance with the manufacturer's recommendations.

Method of Measurement:

This work will be measured for payment by the actual number flagpoles installed, accepted and measured in place.

Basis of Payment:

This work will be paid for at the unit price for each "Flagpole" complete in place, which shall include flagpole, excavation and backfill, foundation, accessories, tools, material and labor incidental thereto.

Pay Item
Flagpole

Pay Unit
EA.

ITEM #1220013A – CONSTRUCTION SIGNS - BRIGHT FLUORESCENT SHEETING

Article 12.20.01 – Description: The Contractor shall furnish construction signs with bright fluorescent sheeting and their required portable supports or metal sign posts that conform to the requirements of NCHRP Report 350 (TL-3). The construction signs and their required portable supports or metal sign posts shall conform to the signing requirements stated in Article 9.71 "Maintenance and Protection of Traffic", as shown on the plans and/or as directed by the Engineer.

Article 12.20.02 – Materials: Prior to using the construction signs and their portable supports, the Contractor shall submit to the Engineer a copy of the Letter of Acceptance issued by the FHWA to the manufacturer documenting that the devices (both sign and portable support tested together) conform to NCHRP Report 350 (TL-3).

Portable sign supports shall be designed and fabricated so as to prevent signs from being blown over or displaced by the wind from passing vehicles. Portable sign supports shall be approved by the Engineer before they are used. Mounting height of signs on portable sign supports shall be a minimum of 1 foot and a maximum of 2 feet, measured from the pavement to the bottom of the sign.

All sign faces shall be rigid and reflectorized. Sheet aluminum sign blanks shall conform to the requirements of Article M.18.13. Metal sign posts shall conform to the requirements of Article M.18.14. Application of reflective sheeting, legends, symbols, and borders shall conform to the requirements specified by the reflective sheeting manufacturer. Attachments shall be provided so that the signs can be firmly attached to the portable sign supports or metal posts without causing damage to the signs. A Materials Certificate and Certified Test Report conforming to Article 1.06.07 shall be required for the reflective sheeting.

The following types of construction signs shall not be used: mesh, non-rigid, roll-up, corrugated or waffle board types substrates, foam core and composite aluminum sign substrates.

Reflective sheeting shall conform to the following:

The fluorescent orange prismatic retroreflective sheeting shall consist of prismatic lenses formed in a transparent fluorescent orange synthetic resin, sealed, and backed with an aggressive pressure sensitive adhesive protected by a removable liner. The sheeting shall have a smooth surface.

Physical Properties:

A. Photometric - Coefficient of Retroreflection R_A

When the sheeting applied on test panels is measured in accordance with ASTM E 810, it shall have minimum coefficient of retroreflection values as shown in Table I. The rotation angle shall be as designated by the manufacturer for test purposes, the observation angles

shall be 0.2 degrees and 0.5 degrees, the entrance angles (component B₁) shall be -4 degrees and +30 degrees.

TABLE I

Minimum Coefficient of Retroreflection R_A
Candelas per footcandle per square foot

Observation Angle (deg.)	Entrance Angle (deg.)	R _A Orange
0.2	- 4	200
0.2	+ 30	90
0.5	- 4	80
0.5	+ 30	50

The rotation shall be as designated by the manufacturer.

B. Daytime Color

Color shall conform to the requirements of Table II. Daytime color and maximum spectral radiance factor (peak reflectance) of sheeting mounted on test panels shall be determined instrumentally in accordance with ASTM E 991. The values shall be determined on a Hunter Lab Labscan 6000 0/45 Spectrocolorimeter with option CMR 559 (or approved equal 0/45 instrument with circumferential viewing illumination). Computations shall be done in accordance with ASTM E 308 for the 2 degree observer.

TABLE II

Color Specification Limits** (Daytime)

Color	1		2		3		4		Reflectance Limit Y (%)	
	X	Y	X	Y	X	Y	X	Y	MIN	MAX
Orange (new)	.583	.416	.523	.397	.560	.360	.631	.369	28	-
Orange (weathered)	.583	.416	.523	.397	.560	.360	.631	.369	20	45

Maximum Spectral Radiance Factor, new: 110%, min.

weathered: 60%, min.

** The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 standard colorimetric system measured with standard illuminant D65.

C. Nighttime Color

Nighttime color of the sheeting applied to test panels shall be determined instrumentally in accordance with ASTM E 811 and calculated in the u', v' coordinate system in accordance with ASTM E 308. Sheeting shall be measured at 0.33 degrees observation

and -4 degree entrance at rotation as determined by the manufacturer for test purposes. Color shall conform to the requirements of Table III.

TABLE III
Color Specification Limits ** (Nighttime)

Color	1		2		3		4	
	u'	v'	u'	v'	u'	v'	u'	v'
Orange (new and weathered)	.400	.540	.475	.529	.448	.522	.372	.534

D. Resistance to Accelerated Weathering

The retroreflective surface of the sheeting shall be weather resistant and show no appreciable cracking, blistering, crazing, or dimensional change after one year's unprotected outdoor exposure in south Florida, south-facing and inclined 45 degrees from the vertical, or after 1500 hours exposure in a xenon arc weatherometer in accordance with ASTM G26, Type B, Method A. Following exposure, panels shall be washed in a 5% HCL solution for 45 seconds, rinsed thoroughly with clean water, blotted with a soft clean cloth and brought to equilibrium at standard conditions. After cleaning, the coefficient of retroreflection shall be not less than 100 when measured as in D.2, below, and the color is expected to conform to the requirements of Tables II and III for weathered sheeting. The sample shall:

1. Show no appreciable evidence of cracking, scaling, pitting, blistering, edge lifting or curling or more than 0.031 inch shrinkage or expansion.
2. Be measured only at angles of 0.2 degrees observation, -4 degrees entrance, and rotation as determined by the manufacturer for test purposes. Where more than one panel of color is measured, the coefficient of retroreflection shall be the average of all determinations.

E. Impact Resistance

The retroreflective sheeting applied according to the manufacturer's recommendations to a test panel of alloy 6061-T6, 0.040 inch by 3 inches by 5 inches and conditioned for 24 hours, shall show no cracking outside the impact area when the face of the panel is subjected to an impact of 100 inch-pounds, using a weight with a 0.625 inch diameter rounded tip dropped from a height necessary to generate an impact of 100 inch-pounds, at test temperatures of both 32° F and 72° F.

F. Resistance to Heat

The retroreflective sheeting, applied to a test panel as in E., above, and conditioned for 24 hours, shall be measured in accordance with Paragraph A. at 0.2 degree observation and -4 degree entrance angles at rotation as determined by the manufacturer for test purposes and

exposed to $170^{\circ} \pm 5^{\circ}$ F for 24 hours in an air circulating oven. After heat exposure the sheeting shall retain a minimum of 70% of the original coefficient of retroreflection.

G. Field Performance:

Retroreflective sheeting processed and applied to sign blank materials in accordance with the sheeting manufacturer's recommendations, shall perform effectively for a minimum of 3 years. The retroreflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions; or (2) the coefficient of retroreflection is less than 100 when measured at 0.2 degrees observation and -4 degree entrance. All measurements shall be made after sign cleaning according to the sheeting manufacturer's recommendations.

Article 12.20.03 – Construction Methods: Ineffective signs, as determined by the Engineer and in accordance with the ATSSA guidelines contained in "Quality Standards for Work Zone Traffic Control Devices", shall be replaced by the Contractor at no cost to the State.

Signs and their portable sign supports or metal posts that are no longer required shall be removed from the project and shall remain the property of the Contractor.

Article 12.20.04 – Method of Measurement: Construction Signs - Bright Fluorescent Sheeting will be measured for payment by the number of square feet of sign face. Sign supports will not be measured for payment.

Article 12.20.05 – Basis of Payment: "Construction Signs - Bright Fluorescent Sheeting" required and used on the project will be paid for at the Contract unit price per square foot. This price shall include the furnishing and maintenance of the signs, portable sign supports, metal sign posts and all hardware. Each sign and support or posts will be paid for once, regardless of the number of times it is used.

Pay Item

Construction Signs – Bright Fluorescent Sheeting

Pay Unit

S.F.

Item # 1400185A – 1 ¼" HIGH DENSITY POLYETHYLENE PIPE FORCE MAIN (SANITARY SEWER)

Description:

This item shall consist of furnishing all labor, materials, tools and equipment necessary to install and test the 1 ¼" sanitary sewer force main from Sanitary Pump Station No. 1 to the Sanitary Manhole upstream of the Pumping Station (Sanitary Sewer). This work includes furnishing and installing the HDPE pipe, connecting at manholes, and restoration of the surface of the trench outside the limits of the new facility site. Pressure testing is also included as part of this item. This work shall also include all clean-out and air-release structures (manholes), fittings, valves, and appurtenances.

Submit the following in accordance with Form 816 Article 1.20-1.05.02 and NOTICE TO CONTRACTOR – SUBMITTALS.

1. Product Data for all materials.
2. Field quality-control inspection and test reports.

Quality Assurance: Materials and installation of high density polyethylene force main shall be in accordance with the Metropolitan District (MDC) policies and these Specifications.

Materials:

HDPE Force Main Pipe: Pipe shall be of a manufacturer who can demonstrate at least 5-years of experience in the manufacture of polyethylene pipe. The pipe shall be SDR-9 having a 250 psi pressure rating. Polyethylene pipe shall be extra-high molecular weight, high density thylene/hexane copolymer PE 3408 polyethylene resin meeting ASTM D3550 having a cell classification of PE345434C. Pipe shall be designed so that short term surge pressures of 2.5 times the specified pressure rating are allowed.

Fittings: Fittings and couplings shall be polypropylene body, UV-stabilized, true stab, insert-free, suitable for use on SDR 9 to SDR 17 pipe. Items shall be as supplied by ISCO Industries, or equal. Fittings and couplings shall have a 200 psi working pressure ratings.

Bedding: Bedding material shall comply with the requirements of Form 816 subarticle M.08.01-21.

Underground Warning Tape: Detectable warning tape shall be acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep. Warning tapes shall be solid blue film with continuously printed black-letter caption "CAUTION--SEWER LINE BURIED BELOW."

Construction Methods:

General: Installation of high density polyethylene force main shall conform to the Metropolitan District (MDC) standards and these specifications.

Do not store plastic pipe and fittings in direct sunlight. Protect pipe, pipe fittings, and seals from dirt and damage. Plans indicate general location and arrangement of sanitary piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

HDPE Pipe: Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

1. Install force-main, pressure piping with 54-inch minimum cover.
2. Join HDPE force-main, pressure piping according ASTM D 2855.
3. Place plug in end of incomplete piping at end of day and when work stops.

Excavation: Excavation and backfilling shall be performed as described herein and in accordance with Article 2.05.03 of Form 816.

Bedding: Placement of bedding material shall comply with Form 816 Section 6.51.

Warning Tape: Install detectable warning tapes directly over piping.

Field Quality Control: Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction. During installation, notify authorities having jurisdiction at least 3 calendar days before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing installation.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
5. Test force-main piping according to procedures of MDC and all authorities having jurisdiction or, in absence of published procedures, as follows:
 - a. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - b. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - c. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 - d. Prepare reports for tests and required corrective action.

Cleaning: Clean interior of piping of dirt and superfluous material. Flush with potable water.

Method of Measurement:

This work will be measured for Payment by the actual number of linear feet of 1 ¼" HDPE Force Main (Sanitary Sewer) installed and accepted.

Basis of Payment:

This work will be paid for at the unit price per linear foot of "1 ¼" HDPE Force Main (Sanitary Sewer)" complete in place, which shall include all material, fittings, clean-out and air-release structures (manholes), fittings, valves, equipment, tools, appurtenances and labor incidental thereto. Care and protection of existing pipes and utilities, and other structures; disposing of excess materials; dewatering and warning tape are also included.

<u>Pay Item</u>	<u>Pay Unit</u>
1 ¼" High Density Polyethylene Pipe Force Main (Sanitary Sewer)	LF

ITEM # 1403044A – SANITARY PUMP STATION NO. 1

Description:

Work under this item shall consist of furnishing and installing wet-well/drywell packaged grinder sewage pump station, including all related excavation, bedding, backfill, and electrical power and control installation.

Pump station shall be constructed of fiberglass reinforced polyester resin, and include a NEMA6P electrical quick disconnect, pump removal system, stainless steel discharge assembly/shut-off valve, anti-siphon valve/check valve, electrical alarm panel and all necessary internal wiring and controls.

Submittals: Submit the following in accordance with Form 816 Article 1.20-1.05.02 and **NOTICE TO CONTRACTOR – SUBMITTALS**.

Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

Shop Drawings: Show fabrication and installation details for packaged sewage pumping station. Detail equipment assemblies and indicate dimensions; shipping, installed, and operating weights; loads; required clearances; method of field assembly; components; electrical characteristics; and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

Quality Assurance Submittals:

1. Field quality-control test reports.
2. Source quality-control test reports.

Maintenance Data: For equipment to include in the operation and maintenance manuals specified in Form 816 Article 1.20-1.08.14 subsection 2 and described in **NOTICE TO CONTRACTOR – CLOSEOUT DOCUMENTS**.

Quality Assurance:

1. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

Materials:

Wet-Well, Packaged Sewage Pumping Stations with Submersible Grinder Sewage Pumps:

Basis-of-Design Product: Subject to compliance with requirements, provide Model DH071 with WH Series pump and fiberglass reinforced polyester resin (FRP) basin and lid as manufactured by Environmental One Corporation, or an approved equal.

1. Description: Factory fabricated, assembled, and tested with wet well for sewage pumps and collection of sanitary sewage and with dry equipment chamber for controls and accessories.
 - a. Orientation: Shell underground with top flush with grade.
 - b. Basin: Factory fabricated from FRP. Cover shall be lockable and watertight.
 - c. The inlet opening shall be field cut to accommodate field conditions/elevation of the building soil pipe. Opening shall be fitted with an EPDM grommet.
 - d. Accessway shall include a 2-inch vent.
 - e. Sewage Pumps: One submersible grinder-type sewage pump, quick-disconnect system, controls, and piping. Include stainless-steel grinder impeller and hermetically sealed motor with moisture-sensing probe, mechanical seals, and waterproof power cable.
 - f. Pump shall be a motor driven, integral, vertical rotor, solids handling pump of the progressing cavity type with a single mechanical seal. The mechanical seal shall prevent leakage between the pump and the motor. The seal shall have a carbon rotating surface and immobile ceramic seat with faces precision lapped and held in position by a stainless steel spring.
 - g. Grinder: Grinder impeller shall be one piece, a 4140 cutter wheel of the rotating type with the cutter teeth hardened to Rockwell 50 – 60c for abrasion resistance. The grinder shall be constructed in a way as to minimize clogging and jamming under all normal operating conditions including starting and stopping. The grinder shall be capable of cutting all elements in normal domestic sewage, including a reasonable amount of “foreign objects,” such as wipes, wood, plastic, paper, glass, rubber and other similar objects, to finely divided particles which will pass freely through the passages of the pump and the 1-1/4 inch diameter stainless steel discharge piping.
 - h. Motor: The motor shall be a 1725 RPM, 240 Volt 60 Hertz, 1 HP, 1 Phase, capacitor start, ball bearing, air cooled induction type with a starting torque of 8.4 foot pounds.
 - i. Controls: All motor starting controls shall be located within the enclosure of the core unit. The level sensing control housing must be attached to the pump in a way that it can be removed from the basin with the pump and in a way that reduces the chance for accumulation of debris and grease. The level sensing control housing must be made from high-impact thermoplastic copolymer over-molded with a thermo plastic elastomer. The wastewater level sensing controls must be housed in a different enclosure than the motor starting controls.
2. Capacities and Characteristics:
 - a. Diameter or Dimensions of Shell: As noted on Plans, approximately 7.5-feet deep from manhole rim to bottom of inside wet well.
 - b. Height of Shell Base Section: As noted on Plans.
 - c. Pumping Station, Inlet Pipe Size: As noted on Plans.
 - d. Pumping Station, Discharge Pipe Size: As noted on Plans.
 - e. Sewage Pump: One required.

f. Sewage Pump:

1. Capacity: 13 gpm
2. Total Dynamic Head: 42 feet
3. Speed: 3450 rpm
4. Discharge Size: 1.25 inch pipe flange
5. Motor Size: 1 hp, 1,725 rpm
6. Electrical Characteristics:
 - a. Volts: 240 V
 - b. Phases: One
 - c. Hertz: 60

Control Sequence of Operation: Cycle the sewage pump on and off automatically to maintain wet-well sewage level. Automatic control operates the pump if wet-well level rises above starting point of the start level, until shutoff level is reached.

120-V accessory controls with one 15-amp, double-pole circuit breaker for the pump core's power circuit and one 15-amp, single-pole circuit breaker for the alarm circuit.

Control Panel: Enclosure complying with UL 508A with separate compartments and covers for controllers, circuit breakers, transformers, alternators, and single-phase controls. The control panel shall include push-to-run switch, push-to-silence switch, external audible and visual alarm, redundant pump start, and high level alarm.

1. Mounting: On the exterior of the adjacent building and as directed by the Engineer.
2. Enclosure: NEMA 4X made from thermoplastic polymer with a hinged lockable cover with padlock.

Install labels on panel face to identify switches and controls.

Remote Sentry Indoor Alarm module: A separate, remote indoor alarm module shall be provided to give warning indoors if the high level alarm is triggered. Both a visual and audible alarm shall be included. The module shall have an internal power source.

Wiring: Tin-copper wiring.

Accessories:

1. High-Water Audio Alarm: Horn for audio indication of station high-water level, energized by separate level-detecting device.
2. Remote Sentry Indoor Alarm Module: Include contacts for connection to remote alarm panel installation where shown on the Plans.
3. Remote Alarm Light: Red, installed where shown on the Plans

Miscellaneous Materials:

1. Electrical: Conduit, low voltage conductors, grounding and bonding, and related materials as specified in CSI Division 26 Sections.
2. Stainless steel flexible connector for the discharge.

Granular Fill shall comply with Form 816 Article 2.14.02

Entrance Cover: Lid shall be made from fiberglass reinforced plastic.

Piping Connections: Unless otherwise indicated, make the following piping connections:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment having NPS 2 or smaller threaded pipe connection.
2. Install transition fitting from Sanitary Pump Station No. 1 discharge piping to HDPE Force Main immediately downstream of Sanitary Pump Station No. 1 using NPT x Plain End Adapter conforming to ASTM D 1784, ASTM D 3139 and ASTM F 477.

Piping: HDPE DR 9, ASTM D 3212, ASTM D 3350.

Pipe Fittings: HDPE Threaded Fittings, ASTM D 3212, ASTM D 3350.

Valves: Stainless steel. Include ball and check valves on each discharge pipe. Valves shall be suitable for wastewater.

Source Quality Control: Test and inspect sewage pumps. Include test recordings that substantiate correct performance of pumps at design head, capacity, suction lift, speed, and horsepower. Test accessories and controls through complete cycle. Include test recordings that substantiate correct performance.

Construction Methods:

Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

Examine roughing-in of sewerage piping systems to verify actual locations of piping connections before packaged sewage pumping station installation.

Proceed with installation only after unsatisfactory conditions have been corrected.

Refer to Form 816 Section 2.02, "Roadway Excavation, Formation of Embankment and Disposal of Surplus Material" for excavating, trenching, and backfilling requirements.

Excavation shall comply with Form 816 Article 2.05.03

Install 1-foot of $\frac{3}{4}$ " compacted stone under pump station.

Install packaged sewage pumping station components where indicated, according to specific equipment and piping arrangement indicated and manufacturer's written instructions.

Sanitary sewer piping installation requirements are specified elsewhere. Plans indicate general arrangement of piping.

Ground equipment according to CSI Division 26 Section 260526, "Grounding and Bonding for Electrical Systems."

Connect wiring according to CSI Division 26 Section 260519, "Low-Voltage Electrical Power Conductors and Cables."

Install identifying labels permanently attached to equipment.

Install operating instruction signs permanently attached to equipment or as directed by the Engineer.

Perform tests and inspections and prepare test reports. Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

Tests and Inspections:

1. After installing packaged sewage pumping stations and after electrical circuitry has been energized, test for compliance with requirements. Furnish water required for pump tests.
2. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

Remove and replace packaged sewage pumping stations that do not pass tests and inspections and retest as specified above.

Engage a factory-authorized service representative to perform startup service. Complete installation and startup checks according to manufacturer's written instructions. Adjust pump, accessory, and control settings, and safety and alarm devices.

Training: Refer to Form 816 Article 1.20-1.08.14 subsection 3 for additional information. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged sewage pumping stations.

Method of Measurement:

This item will be paid for at the contract lump sum price for “Sanitary Pump Station No. 1” complete.

Basis of Payment:

This item will be paid for at the contract lump sum price for “Sanitary Pump Station No. 1”, which price shall include all excavation, material, equipment, labor, and work incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Sanitary Pump Station No. 1	LS

ITEM # 1404105A – PUMPING STATION (SANITARY SEWER)

Description:

Work under this item shall consist of furnishing and installing wet-well, packaged pumping stations with submersible grinder sewage pumps, control panel mounted on a concrete pad or painted steel posts with concrete footings, including all related excavation, bedding, backfill, and electrical work.

Performance Requirements: Pressure Rating of Sewage Pumps and Discharge Piping Components: At least equal to sewage pump discharge pressure, but not less than 200 psig.

Pressure Rating of Other Piping Components: At least equal to system operating pressure.

Submittals: Submit the following in accordance with Form 816 Article 1.20-1.05.02 and NOTICE TO CONTRACTOR – SUBMITTALS.

Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

Shop Drawings: Show fabrication and installation details for each packaged sewage pumping station. Detail equipment assemblies and indicate dimensions; shipping, installed, and operating weights; loads; required clearances; method of field assembly; components; electrical characteristics; and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

Quality Assurance Submittals:

1. Field quality-control test reports.
2. Source quality-control test reports.
3. Structural calculations and shop drawings for control panel mounting system

Maintenance Data: For equipment to include in the operation and maintenance manuals specified in Form 816 Article 1.20-1.08.14 subsection 2 and described in NOTICE TO CONTRACTOR – CLOSEOUT DOCUMENTS.

Quality Assurance:

1. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

Comply with HI 1.1-1.2, "Centrifugal Pumps for Nomenclature and Definitions"; HI 1.3, "Centrifugal Pumps for Design and Application"; and HI 1.4, "Centrifugal Pumps for Installation, Operation and Maintenance," for sewage pumps.

Comply with UL 778, "Motor-Operated Water Pumps," for sewage pumps.

Materials:

Wet-Well, Packaged Sewage Pumping Stations with Submersible Grinder Sewage Pumps:

Basis-of-Design Product: Subject to compliance with requirements, provide Model No. WW72-WGD10-03 as manufactured by Park Environmental Equipment, or an approved equal.

1. Description: Factory fabricated (to the extent possible), assembled, and tested with wet well for sewage pumps and collection of sanitary sewage and with dry equipment chamber for controls and accessories.
 - a. Orientation: Shell underground with top flush with grade.
 - b. Basin: Factory fabricated from precast concrete.
 - c. Sewage Pumps: Two submersible grinder-type sewage pumps, with guide rail, quick-disconnect system, controls, and piping. Include stainless-steel grinder impeller and hermetically sealed motor with moisture-sensing probe, mechanical seals, and waterproof power cable.
2. Capacities and Characteristics:
 - a. Diameter or Dimensions of Shell: As noted on Plans, approximately 10-feet deep from manhole rim to bottom of inside wet well.
 - b. Height of Shell Base Section: As noted on Plans.
 - c. Pumping Station, Inlet Pipe Size: As noted on Plans.
 - d. Pumping Station, Discharge Pipe Size: As noted on Plans.
 - e. Sewage Pumps: Two required.
 - f. Each Sewage Pump:
 1. Capacity: 245 gpm
 2. Total Dynamic Head: 63 feet
 3. Speed: 3450 rpm
 4. Impeller: Grinder type
 5. Discharge Size: 4-inch pipe flange
 6. Motor Size: 10 hp
 7. Electrical Characteristics:
 - a. Volts: 208 V
 - b. Phases: Three
 - c. Hertz: 60

Control Sequence of Operation: Cycle each sewage pump on and off automatically to maintain wet-well sewage level. Automatic control operates both pumps in parallel if wet-well level rises

above starting point of low-level pump, until shutoff level is reached. Automatic alternator, with manual disconnect switch, changes sequence of lead-lag sewage pumps at completion of each pumping cycle.

Float-Switch System: Senses variations of sewage level in wet well. Include high and low adjustments capable of operating on 6-inch minimum differential of liquid level.

Motor Controllers: Magnetic, full voltage, non-reversing. Include under-voltage release, thermal-overload heaters in each phase, manual reset buttons, and hand-automatic selector switches. Include circuit breakers to provide branch-circuit protection for each controller.

120-V accessory controls with 15-A, single-phase circuit breakers or fuses for each item.

Control Panel: Enclosure complying with UL 508A with separate compartments and covers for controllers, circuit breakers, transformers, alternators, and single-phase controls. Include 20-A duplex receptacle in NEMA WD 1, Configuration 5-20R mounted on exterior of control panel.

1. Mounting: on concrete pad or posts with concrete footings.
2. Enclosure: NEMA 250, Type 4X

Install labels on panel face to identify switches and controls.

Control Panel shall be either pad mounted on a concrete pad, or post mounted on painted steel posts with concrete footings. The mounting height of the center of the panel shall be approximately 54-inches above the ground surface and shall comply with all applicable regulations. The installed panel shall deflect no more than ½-inch (measured at the top of the panel) when subject to a force of not less than 1,000-lbs from any direction.

Wiring: Tin-copper wiring.

Accessories:

1. High-Water Audio Alarm: Horn for audio indication of station high-water level, energized by separate level-detecting device. Include alarm silencer switch and relay in station.
2. Pump Failure Alarm: Alarm light indication of a pump failure (overheat).
3. Remote Alarm Circuit: Provide dry contacts for alarm circuit integration into the building management system for high-level and pump failure indication.
4. Remote Alarm Light: Red, installed on or adjacent to the control panel at 10-feet above the ground surface.

Miscellaneous Materials:

1. Structural Steel: ASTM A 6/A 6M, W or HP shapes, or ASTM A 36/A 36M, plates or beams.
2. Grout: ASTM C 1107, Grade B, non-shrink cement grout. Design Mix: 5000-psi, 28-day compressive strength.

3. Concrete: Concrete is specified in CSI Division 03 Section 033000, "Cast-in-Place Concrete."
4. Electrical: Conduit, low voltage conductors, grounding and bonding, and related materials as specified in CSI Division 26 Sections.

Packaged Sewage Pumping Station Fabrication: Fabricate basin from precast concrete:

1. Concrete: Class 1 with a design strength of 4500 psi at 28 days.
2. Reinforcement: Grade 60 reinforced with steel rebar conforming to ASTM A615 on required centers, or an approved equal.

Basin shall be made watertight.

Granular Fill shall comply with Form 816 Article 2.14.02

Entrance Cover: H-20 Rated, flood proof and corrosion resistant, with lock. Include way to open cover from inside tube if cover is locked.

Air Vent: Duct fabricated from corrosion-resistant material, extended to above grade, outlet turned down, and with insect screen in outlet.

Piping Connections: Unless otherwise indicated, make the following piping connections:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment having NPS 2 or smaller threaded pipe connection.
2. Install transition fitting from Sanitary Pump Station No. 1 discharge piping to PVC Force Main immediately downstream of Sanitary Pump Station No. 1 using NPT x Plain End Adapter conforming to ASTM D 1784, ASTM D 3139 and ASTM F 477.

Piping: Solid-Wall PVC Pipe: ASTM D 1785, Schedule 80 with ASME B1.20 NPT ends

Pipe Fittings: PVC Threaded Fittings, ASTM D 2464, Schedule 80

Valves: PVC or Bronze. Include ball and check valves on each discharge pipe. Valves shall be suitable for wastewater.

Wiring: Tin-coated copper.

Source Quality Control: Test and inspect sewage pumps according to HI 1.6, "Centrifugal Pump Tests." Include test recordings that substantiate correct performance of pumps at design head, capacity, suction lift, speed, and horsepower. Test accessories and controls through complete cycle. Include test recordings that substantiate correct performance.

Construction Methods:

Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

Examine roughing-in of sewerage piping systems to verify actual locations of piping connections before packaged sewage pumping station installation.

Proceed with installation only after unsatisfactory conditions have been corrected.

Refer to Form 816 Section 2.02, "Roadway Excavation, Formation of Embankment and Disposal of Surplus Material" for excavating, trenching, and backfilling requirements.

Excavation shall comply with Form 816 Article 2.05.03

Install packaged sewage pumping station components where indicated, according to specific equipment and piping arrangement indicated and manufacturer's written instructions.

Grout under and around basin. Ensure that there are no voids between foundation slab and underslab of pumping station.

Fill voids between basin sidewalls, sleeves, and piping and make watertight seal with grout.

Join separate sections of basin with gaskets to make watertight.

Sanitary sewer piping installation requirements are specified elsewhere. Plans indicate general arrangement of piping.

Install piping adjacent to machine to allow service and maintenance.

Install electrical conduits to adjacent handholes installed by others.

Ground equipment according to CSI Division 26 Section 260526, "Grounding and Bonding for Electrical Systems."

Connect wiring according to CSI Division 26 Section 260519, "Low-Voltage Electrical Power Conductors and Cables."

Connect power and alarm circuit wiring to adjacent electrical handholes installed by others.

Install identifying labels permanently attached to equipment.

Install operating instruction signs permanently attached to equipment or on pumping station wall near equipment.

Prepare and paint ferrous piping in wet wells, structural-steel supports, and anchor devices with coal-tar epoxy-polyamide paint according to SSPC-Paint 16.

Paint field-welded areas to match factory coating.

Perform tests and inspections and prepare test reports. Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

Tests and Inspections:

1. After installing packaged sewage pumping stations and after electrical circuitry has been energized, test for compliance with requirements. Furnish water required for pump tests.
2. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

Remove and replace packaged sewage pumping stations that do not pass tests and inspections and retest as specified above.

Engage a factory-authorized service representative to perform startup service. Complete installation and startup checks according to manufacturer's written instructions. Adjust pump, accessory, and control settings, and safety and alarm devices.

Training: Refer to Form 816 Article 1.20-1.08.14 subsection 3 for additional information. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged sewage pumping stations.

Method of Measurement:

This item will be paid for at the contract lump sum price for "Pumping Station (Sanitary Sewer)" complete.

Basis of Payment:

This item will be paid for at the contract lump sum price for "Pumping Station (Sanitary Sewer)", which price shall include all excavation, material, equipment, labor, and work incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Pumping Station (Sanitary Sewer)	LS

ITEM # 1700001A – SERVICE CONNECTIONS (ESTIMATED COST)

Description: This work shall consist of disconnection, alteration and reconnection of those existing utility services owned by property owners at locations necessary to complete this project and as ordered by the Engineer. This work shall include the coordination with the affected utility companies and customers. Any damage caused by the Contractor or Subcontractors, as determined by the Engineer, shall be corrected by the Contractor in accordance with this specification.

Materials: All materials shall be provided by the Contractor and shall meet the current standards of the affected service.

Construction Methods: The Contractor shall perform all work in coordination with the Utility Company and affected property owner and as directed by the Engineer. Certain work may require use of a licensed and/or certified tradesman when such work is required by local and/or state codes.

Any utility customer's service interruption shall be done in a way that minimizes adverse impacts to the customer and affected utility.

Any work and materials supplied by the utility companies shall be on a billable basis to the Contractor.

Method of Measurement: The work and materials shall be measured for payment as provided for under Article 1.04.05 Extra Work.

The sum of money shown on the estimate and in the itemized proposal as "Estimated Cost" for this work will be considered the price bid even though payment will be made only for actual work performed. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figure will be disregarded and the original price will be used to determine the total amount for the contract.

Corrective work required to repair damage caused by the Contractor or its Subcontractors shall not be measured for payment.

Basis of Payment: This work will be paid as Extra Work.

<u>Pay Item</u>	<u>Pay Unit</u>
Service Connections (Estimated Cost)	Estimated Cost